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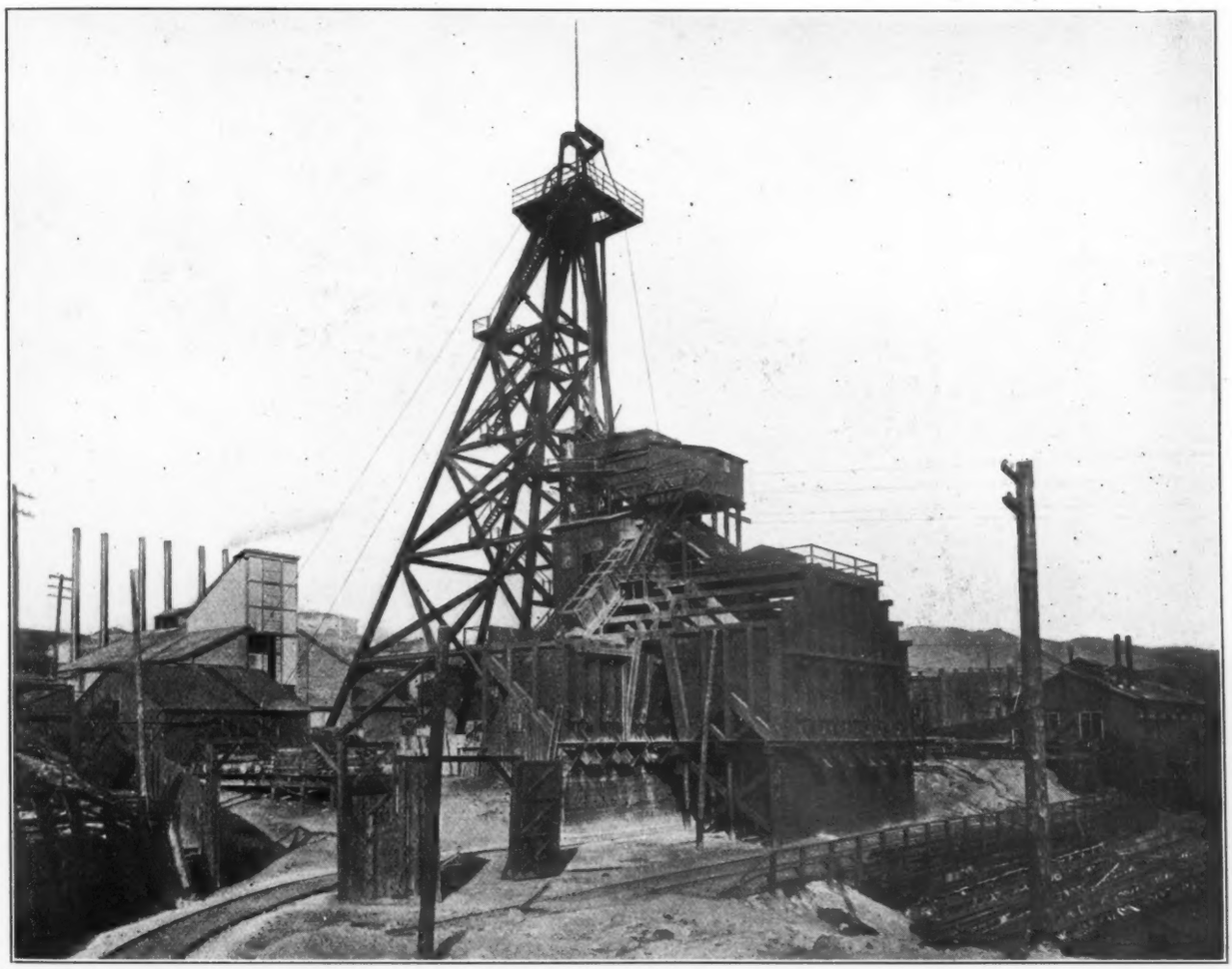
# Methods of Mining and Handling Ore in Butte

## The Bulk of the Ore Comes from below the 1000-foot Level, and Electric Power is Extensively Used above and below Ground

BY EDWIN HIGGINS

Under ordinary conditions the daily ore production of the Butte mines varies between 14,000 and 15,000 tons. Between 9000 and 10,000 tons of this is produced by the Amalgamated, North Butte and Coalition companies, and is shipped for reduction, together with about 1000 tons from the smaller mines, to the Washoe smelter, at Anaconda, 28 miles west of Butte. This ore is transported in steel ore cars of 50 tons capacity, from 40 to 50 cars making up one train. The Boston & Montana company averages about 3500 tons per day, the product being shipped to Great Falls, for reduction. Clark's mines produce an average of 1200 tons per day. This ore is treated at the Butte Reduction Works, in the southern part of the city of Butte, and is hauled from the mines to the smelter by electric motors over the street railway tracks of the town in 30-ton ore cars.



GALLOWS FRAME AND ORE BINS AT THE ORIGINAL MINE

The following data concerning methods of mining and handling the ore are based on operations as carried on by the companies named. These companies work two shifts of 8 hours each in every 24 hours. The remaining 8 hours allows time for all workings to be thoroughly supplied with fresh air. This period is also utilized for an inspection of all workings and machinery, and for any repairing which may be found necessary underground or in the surface plant.

The bulk of the ore mined comes from below a depth of 1000 ft. The following mines are working below the 2000-ft. level:

DEEP MINES AT BUTTE, MONTANA.

| | Ft. |
|---|---|
| High Ore | 2800 |
| Anaconda | 2400 |
| Neversweat | 2400 |
| St. Lawrence | 2400 |
| Mountain View | 2200 |
| Diamond | 2200 |
| Mountain Consolidated | 2200 |
| Gagnon | 2200 |

DEVELOPMENT AND HANDLING ORE

The following is the general scheme followed in the development of the mines and the handling of the ore, although slight deviations from it, occasioned by some unusual condition, are to be met with in several instances:

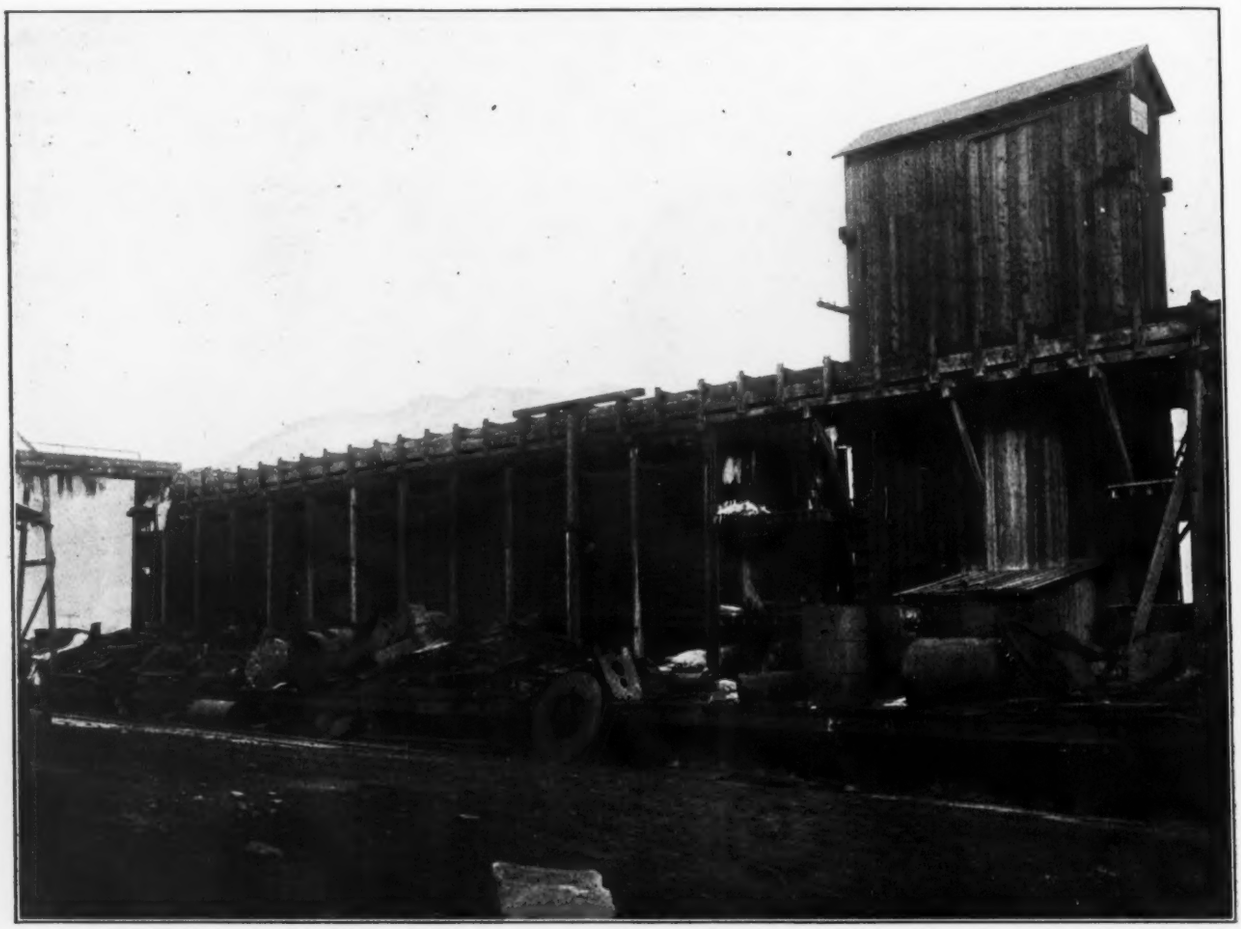
Levels are driven every 200 ft. (in some cases every 100 ft.), and these are connected by raises from 200 to 300 ft. apart. Stoping is begun either at the shaft and continued away from it, or, as is often the case, it is begun at the end line of the property and carried toward the shaft. Where the vein is not wide the system of working away from the shaft is employed, but in cases where the vein is from 50 to 100 ft. in width it is found to be the better plan to begin stoping at the end of the drift and work toward the shaft. The reason for this is obvious. In wide veins the ground is usually heavy and in some cases it is impossible to keep drifts open without constant re-timbering. When work is carried toward the shaft it makes little difference if the worked-out portions cave, for it is not necessary to keep the drifts open for haulage as in the case where the ore is stoped away from the shaft.

Ore chutes are put in at 50 ft. centers. The number of stopes carried on depends on the amount of ore it is desired to mine. Worked-out stopes are square-setted, to be filled in later with waste. The timber and waste used for this work are lowered through the raise from the level above. Sufficient waste for filling is obtained from development and other dead work. Diamond drills are extensively used for prospecting.

All mining is done with air drills, the power for which is electrically developed. The ore is drawn from the chutes into cars carrying from 1500 to 1800 lb. each. These cars are pushed to the main cross-cut or drift, as the case may be, where a trip is made up of from 8 to 10 cars and this is hauled to the shaft station by either mules or horses. The Anaconda company has installed electric motors for underground haulage and it is only a question of a short time before this system will be in operation in all the mines of the larger companies.

At the station the ore is dumped into a pocket, or bin, from which it is delivered to the surface in skips. These pockets have a capacity of from 50 to 150 tons. The skips are self-dumping and have a capacity of from 5½ to 7 tons each. On reaching the surface the ore is dumped into bins, whence it is distributed to the railroad bins. In the case of the Speculator, Leonard and Neversweat mines the bins receiving the ore from the skips are directly over the railroad spur. In other cases a system of electric motor distribution is in operation, or in course of installation.

About 1¾ tons of ore is delivered per shift to the surface per man working underground, the cost ranging from $3 to $4 per ton, according to the price of labor. All men working below the collar of the shaft, except pumpmen, whether they be miners, muckers or trammers, receive the same wages.



THE LEONARD PRECIPITATING PLANT

VENTILATION

Air is supplied to the mines by natural ventilation. In cases where long cross-cuts, drifts or raises are driven, however, the electric fan is resorted to. Connections between the different mines have done a great deal toward relieving a condition which caused much trouble a few years ago.

These openings have served as connecting links in forming natural air courses and the mines may now be said to be fairly well ventilated.

### Drainage and Pumping

The Amalgamated and nearby mines on "the hill" are all drained from two central pumping stations, one in the High Ore and the other in the Leonard. Each of these stations pumps approximately 1200 gal. of water per minute. The water from Clark's mines is all handled through a central pumping station in the Original.

The water issuing from the mines is acid and all columns must be lined with either wood or lead. Pump parts exposed to the water are made of phosphor-bronze.

### Power

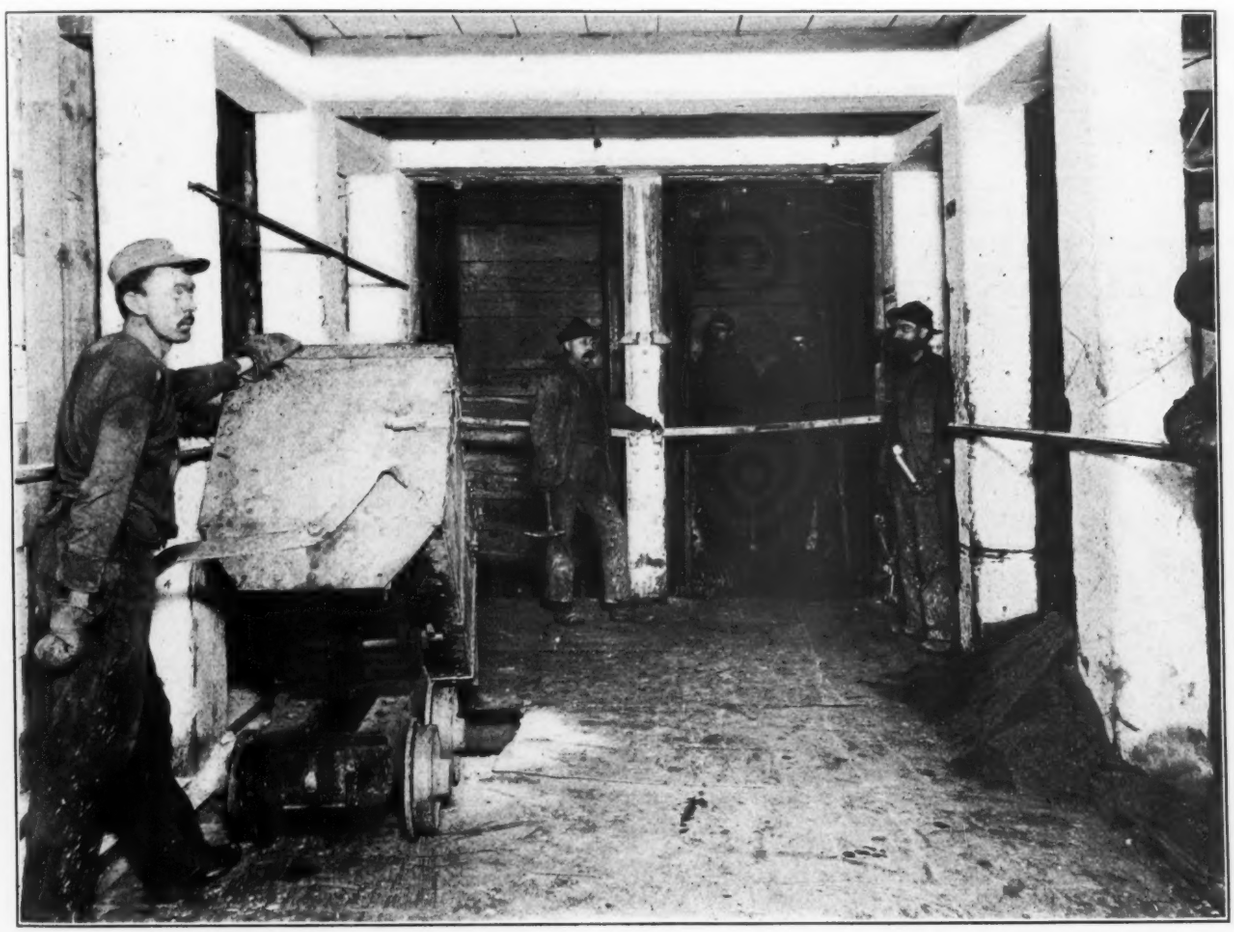
At the present time all compressors supplying air to the mines are electrically driven. Electric pumps of the Aldrich quintriple plunger type have been installed in the Gagnon, Minnie Healy and Rarus mines. Eventually electrically driven pumps will be installed in all the mines. Hoisting is done with steam, except in a few cases where the lift is not great. All the mines are lighted with electric current and have an electric signal system in addition to the rope system.

Experience has proved the economy and efficiency of electric power as compared with steam, and all of the mines will gradually be equipped so that all machinery, with the exception of the hoists, will be electrically operated.

### Special Features

Several of the mines have been equipped with a patent "changing" apparatus. This is an arrangement, placed at the collar of the shaft, whereby the skip may be detached from the cable and a four-decked cage attached. This cage is used for lowering and hoisting the shift. The arrangement consists of a double pocket for the reception of a skip and a cage. A switch diverts the skip so that it enters the pocket. The cable is then attached to the cage and it is brought into position to enter the shaft.

The water issuing from the mines contains an average of 0.0025 per cent. copper, and by the simple process of passing this water over scrap iron, 5,000,000 lb. of copper is recovered per year. This process has been developed from the crude method of allowing the water to flow through ditches, or flumes, in which scrap iron was placed, to the more efficient method of causing the water to pass slowly over a series of shelves, one directly under the other.



UNDERGROUND STATION. ORE HAS JUST BEEN DUMPED INTO THE POCKET

## Copper Mining in Alaska

The mining of copper ore was continued at several localities in the Prince William sound district, and considerable prospecting was done in 1907. There was great activity in the Copper river region, especially in the Chitina copper belt. This region has been rendered more accessible by placing a steamboat on Copper river, above the rapids. The operations in this copper belt have been confined chiefly to making surveys for patents and to doing assessment work. It will be impossible to carry on any great amount of mining until the region is made more accessible by the railway.

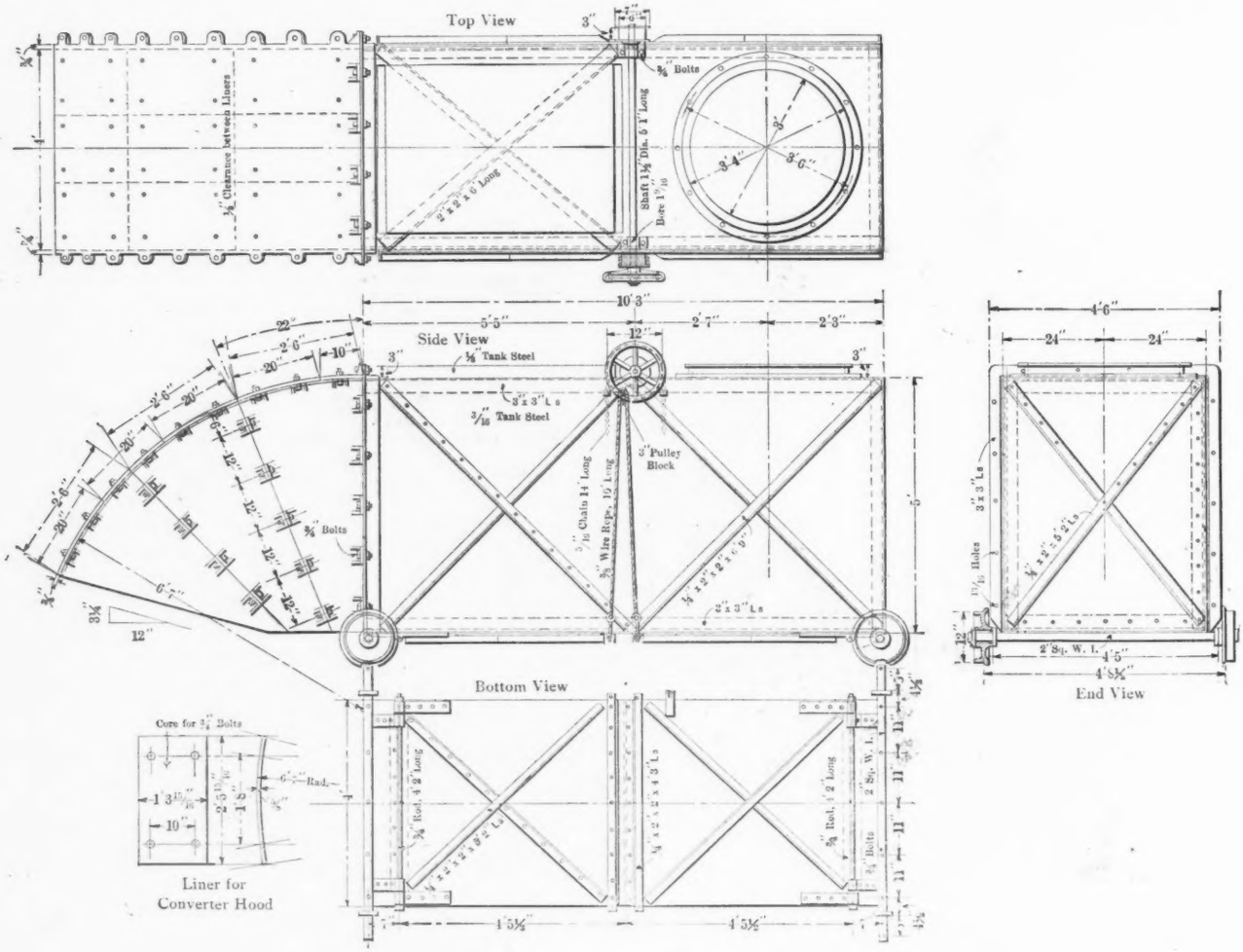
The copper mines of the Ketchikan district, which were being actively developed early in the summer, seriously felt the fall in the price of copper, and some of them were forced to close. This was the case with the Hadley smelter and its subsidiary mining properties. Early in the summer five mines were shipping copper ore, and a number of other properties were being opened.

The above is from a recent report by A. H. Brooks of the United States Geological Survey.

# Movable Converter Hoods

By A. H. Wethey*

Movable converter hoods have been in use at the Butte Reduction Works since May, 1906, when the converter plant there commenced operations. These hoods were designed in 1904, but the detail drawings were not completed until February, 1905. Two stands of converters equipped with these hoods have been in constant operation without repairs since May, 1906. In this plant the converter stands are located in the main building which is 56x106 ft. This building is traversed by a 50-ton electric crane, having a 52-ft. span. Adjoining this building, on the converter side, is a 50-ft. lean-to building extending the full length of the main building. In the apex of the roof of this lean-to building, close to and parallel with the main column supports of the main converter building, is located the converter flue.




DETAILS OF MOVABLE CONVERTER HOOD

### The Hood and Flue

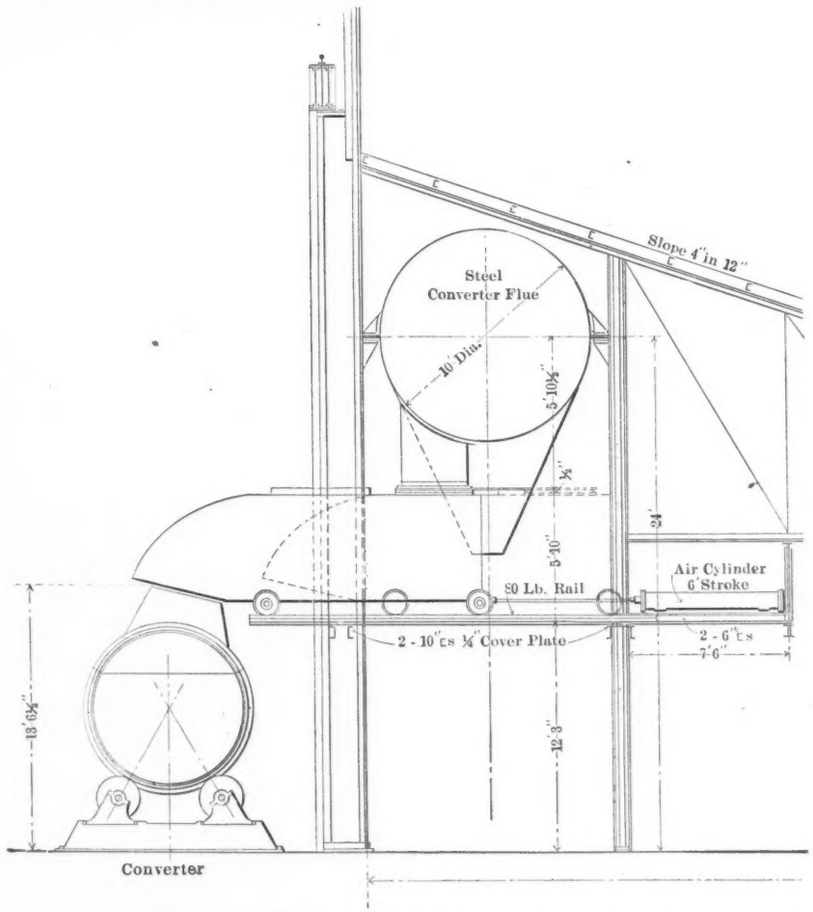
This flue is of sheet steel throughout, being mounted on a track operates between this connection to main flue and nose of converter. The movable hood, the main body of which is rectangular in shape, is 10 ft. 3 in. long, 4 ft. in width and 5 ft. in hight, built up of sheet steel and angles. This body is mounted on axles and wheels located at each end. The entire bottom is composed of a pair of doors, hinged close to the axles; these doors are arranged to open down and are operated by a hand chain device, mounted on the upper side of the main body of the converter hood, which allows them to be readily opened and closed, thereby exposing the whole interior and discharging all dust or accretions on the floors below. On the converter end of the sheet-steel body is mounted a sectional cast-iron hood, having a cast-iron circular top which deflects downward, leaving the hood open on the under side; this opening comes directly over the nose of the converter to admit the gases given out. The circular cast-iron hood cover is lined on the inside with cast-iron liners, which protect the cover from being burnt. Connected to the other end of the movable hood is an air cylinder with a 6-ft. stroke. This cylinder is operated from the converter floor. On the top side of the sheet-steel body, and close to the rear end, a flange opening is provided which corresponds to the size of the opening in the connection to the main flue. When the converter is blowing these two openings are practically together, one over the other, and the opening in the nose of the hood is directly over the nose of the converter.

### Operating the Hood

As the position of the nose of the converter is changed during the different

*General manager for W. A. Clark, Butte, Montana.

stages of blowing, the hood is moved forward or backward, so as to keep the nose of the hood always over the nose of the converter. When the converter is not blowing and during the changing of converter bowls or shells, the movable hood is drawn back entirely out of the way by the air cylinder. When in this position, the inlet of the main flue is shut off by means of a flanged sheet secured on top of the sheet-steel body. The upper face of this sheet is on the same plane as the flanged opening, so that whenever these two openings are not in alinement over each other, this sheet shuts off any exposed part of the flue opening, thereby preventing the admission of air to the main flue, and checking the draft of the other converters. It is a noticeable fact that through the close connections made by these hoods between the converter and the flue and the excellent draft of the flue, this plant is practically free from the noxious gases of the converters, a nuisance so prevalent in many of the converter plants throughout the country.




ARRANGEMENT OF HOOD AND FLUE IN CONVERTER BUILDING

The drawings show the general arrangement of the hood and flue in the converter building; and the details of the hood.

Rossi in *L'Engrais,* proposes to extract the sulphur from the low-grade ores of Sicily with carbon bisulphide.

## White Arsenic in 1907

By Reginald Meeks

The year opened with high prices and a great scarcity of white arsenic. In February and March the prevailing quotation was 7¾c. for large quantities and small lots sold as high as 8¾@9c. In April large amounts of arsenic were brought into the United States from Spain, earlier shipments having been curtailed because of difficulties in shipping from the mines. The augmented supply caused a re-action in price to 7c., but later the market recovered and remained steady at 7¼c. per lb. In spite of the high price certain dealers believed that there would be a further advance and a heavy demand for future delivery did indeed raise the price to 7⅜@7½c. in mid-summer. This buying was purely speculative, however, and the error in judgment was clearly demonstrated at the close of the year.

From August to December the market was heavy and prices fell off gradually to 6¾c. per lb. About the middle of December a violent break occurred, the price dropping to 5¾c., and the market closed weak.

The depressing influences were: (1) large speculative stocks bought in August and unloaded at the close of the year upon an already weak market; (2) heavy imports; (3) increased production abroad with consequent increase in competition; (4) dullness in business and the general financial stringency.

The situation abroad is showing a tendency to weaken, although prices are slightly higher than here. Offers are coming in freely and many countries have recently entered the list of producers. High-grade arsenic is now coming from France, Spain, Belgium, England and Australia, while a little inferior quality and low-grade comes from Italy. A large amount of foreign arsenic is imported into the United States, and the production in this country has also increased.

## Chrome Ore in California

By Charles G. Yale

Some years ago several thousand tons a year of chrome iron ore were shipped from California to the Eastern States, but of late the shipments have virtually ceased because there are no sailing vessels, giving low freights, between San Francisco and New York. Work has entirely ceased in the chrome deposits of Glenn, Tehema, Placer, Alameda, and San Luis Obispo counties, because the mining did not pay, the higher grade of ores having been exhausted. The production in California is now virtually confined to Shasta county, where between 300 and 500 tons are annually mined, and utilized within the State.

The Low Divide chrome mines in Humboldt county, near the coast line, were recently sold, as were some other deposits in Shasta county near Sims, and it is understood attempts will be made to make these deposits profitable by suitable development, etc. Most of the chrome ores in the Coast range of mountains of California assay less than 50 per cent. $Cr_2O_3$, and most of them have ore of only 40 per cent. This is too low a grade for shipment. In San Luis Obispo some years ago concentrating works were established for chrome ores, but these were long since given up as the enterprise did not pay. The Livermore deposits in Alamada county, formerly productive, are no longer so, and little or nothing is being done there.

We hear that an English syndicate has offered to purchase the copper-mining concessions in Greenland which were granted by the Danish Government to Herr Berunburg, a local merchant. Negotiations have been in progress for some time, and engineers have already inspected the mines. Their reports are the basis of the syndicate's offer. The syndicate is said to be prepared to develop the mines on an extensive scale.

# The Method of Breast Stoping at Cripple Creek

## Method Used at the Portland Mine Requires Much Timber and Permits Complete Extraction but Does Not Increase Safety

BY G. E. WOLCOTT*

In a previous article the most common methods of overhead and underhand stoping, employed at Cripple Creek, were described with the exception of overhead stoping with square sets. It now remains to describe breast stoping and the square-set system. In this article the methods employed at the Portland mine will be given. So far as I know no filled stopes are run at this mine.

Breast stoping may be carried on in filled stopes or with timbering. The method in filled stopes does not differ greatly from the overhead method already described except that the muck is left closer to the back and the machine is set up at the breast of the cut instead of underneath. The holes drilled correspond, in narrow stopes, to a drift-round except that there are, of course, no lifters. Fig. 1 represents the method of breast stoping with timbers employed at the Portland mine; the upper portion shows a longitudinal cross-section and the lower part the arrangement of lagging through *AA*. Timbers are carried nearer the back in this method than in overhead stoping and are usually 4 to 5 ft. from the rock. In the illustration a cut has been started at *B* and has been carried along to *M* which shows the position of the machine set up on a cross-bar. If the stope widens to more than about 9 ft., a column and arm are usually used and set up on the muck left on the lagging. Three or four holes are usually drilled in line, vertically, and if more than three rows are required to carry the breast two rounds are usually necessary. The stulls are placed, in this case, at a horizontal distance apart of only 5 ft. and the lagging is cut 6 ft. 3 in. in length so as to overlap the stulls at each end. The lagging is not laid close but is interlaced as shown in the plan view (Fig. 1). The object of this is twofold: (1) it holds up the muck so that the machineman can get at his work without staging; (2) it prevents large boulders from falling down the stope and breaking out stulls, clogging chutes, etc. As the driller advances across the stope the muck is let down behind him, the large boulders being broken before passing through the lagging. Another row of stulls is now started at *B* and proceeds behind the machine so that when one cut is finished the timber is in place to come back and start another cut. The lagging at *A A* is removed to the next row of stulls as soon as it has served its purpose on the preceding cut. With this method of stoping the cuts are carried about 8 ft. high. No manways are shown in the illustration but they are usually carried up with the stulls and lacing, the latter consisting of rough slabs. When the machineman comes over the manway with his round, the opening is protected by closely laid lagging so that no muck can go through. A part of the lacing is omitted at the row of stulls next below so as to allow ingress to the stope.

*Mining engineer, Cripple Creek, Colo.

in the district. Fig. 2 shows a cross-sectional view through a square set stope in the Portland, Fig. 3 the construction of the square sets and Fig. 4 a cross-section through the chute at *AA* of Fig. 2.

In starting the stope, cutting out is first done to the full width and length of the orebody. The stope is then undercut once to allow the sills of the square sets to be placed. Loose muck is left to fill in around and below the sills in order to protect them when breaking through from the next level as the force of the blasting

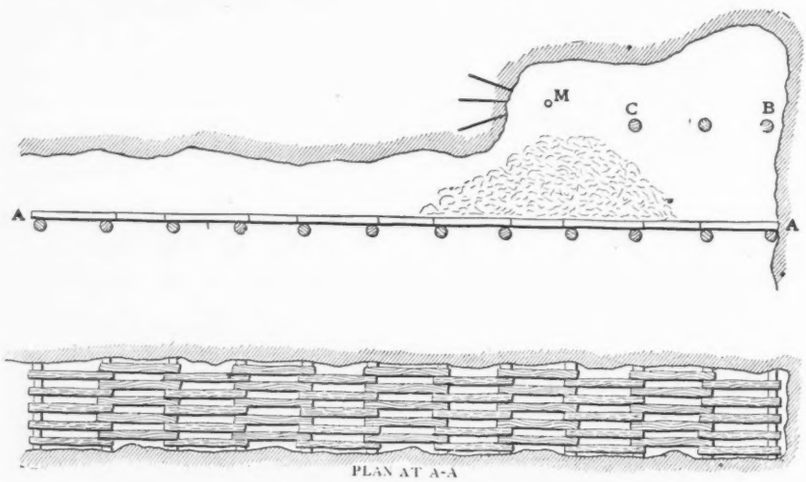



FIG. 1. LONGITUDINAL CROSS-SECTION AND LAGGING IN A TIMBERED BREAST STOPE

### Breast *vs.* Back Stopping

With breast stoping there is less danger of falling rock as no holes have to be started overhead but breakage is more efficient where holes break downward than on one side; drilling in breast stopes is more difficult, as flat holes must be drilled and these give trouble by causing the steel drills to stick. With down holes, water must be carried into the stope. Breast stoping is not adapted to the use of air-hammer stoping machines.

### The Portland Square Set System

The Portland has long been known as the best timbered mine in the Cripple Creek district and probably more money is spent for timber per ton of ore extracted than in any other mine at Cripple Creek. I doubt, however, if this should qualify it as the best timbered mine. This distinction should go with the mine in which is spent the least possible amount per ton of ore extracted, consistent with the safety of the men employed. With regard to safety the Portland is usually reputed to be one of the most dangerous is deadened by the loose material. Only a small portion of the ore, below the square sets, is broken out at a time and timbering follows closely behind the breaking. When the stope is not too wide the sills are placed in one length; if too wide splicing must be done. Immediately above the sills the posts are 8 ft. between tenons to give sufficient hight for the level and above this they are uniformly 7 ft. 3 in. The caps, being 9½ in. when framed at the end, give 8 ft. ½ in. as the total vertical space occupied per set.

### Much Lagging is Required

After the first set is in place 3-in. planks, sawed 5 ft. 8 in. in length to fit the square sets, are laid tightly from wall to wall and lagging, 6 ft. 3 in. in length, is placed over this so as to interlace as in the breast stoping method. This is simply to protect the plank and prevent breakage. Over the chutes and manways the lagging is laid close together. Lagging is also placed over the sills outside of the set or sets left for the level and is carried up

by the posts to the first set. This is also interlaced but only for the purpose of retaining the coarser waste rock.

Breaking down having been started over the first set, rough hand sorting is carried on in the stope. The ore is shoveled into the chutes and the coarse waste is dropped into the spaces lagged up at each side of the level. When the stoping has been carried high enough for another set the timbers are placed in position and the planks from the first set are removed to the next set above. Lagging is now laid tightly over the level and

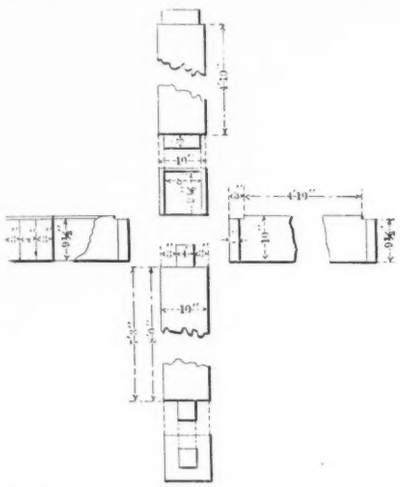


FIG. 3. DETAILS OF SQUARE-SET CONSTRUCTION

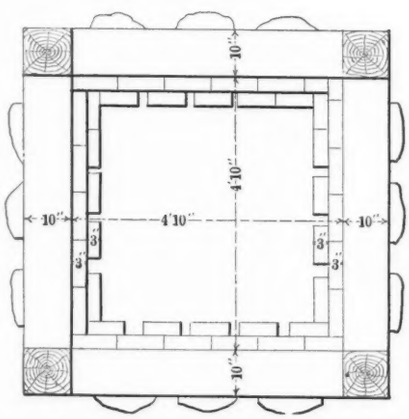



FIG. 4. CROSS-SECTION THROUGH CHUTE OF SQUARE-SET

the chutes carried up another set. The chutes are made of two thicknesses of 3-in. plank, nailed inside a square set. The first layer is placed close together, and the next is placed to overlap the cracks in the first. On the outside of the set, occupied by the chute, rough slabs are nailed five to six inches apart to prevent the waste filling from crushing in the boards of the chute.

### Stoping

Stoping is now carried up, set by set, as in the first case, except that lagging is not left on any of the sets above the lowest. After the first set above the lagging has been placed, canvas, made up in pieces to fit in the square sets, is hung just beneath the plank flooring and serves to catch any fine material which may go through the cracks. Stoping is sometimes done by breasting and sometimes by overhead work depending upon the distance from the back and the chance for a set up. Chutes are carried up every three sets making them 17 ft. center to center.

Upon entering one of the stopes at the Portland mine, one is at once impressed with the immense amount of timber used. Too much is used to permit the working of any low-grade deposit by this method and also too much, I believe, to justify its use in any stope except where extreme conditions demand it. The absolute cost of the timber used is not the only item to be considered for, in the stope, timbermen are frequently in the way of machinemen and trammers and these, in turn, interfere with the timbermen; all therefore mutually impede one another in their work. It is true that, by the method employed here, a large amount of waste need not be hoisted but, to offset this, a great deal of time must be spent in lowering timbers, etc. The method is undoubtedly an efficient one and gives complete ore extraction without losing the level passing through the stope; but it is too cumbersome and expensive to be generally recommended.

I have no data at hand showing the cost of timbering by this method. The absolute timber cost without allowance for breakage could, of course, be readily computed but to this should be added not only the cost of placing in position but also the loss of time in hoisting and loss due to retarding the work of breaking rock in the stope.

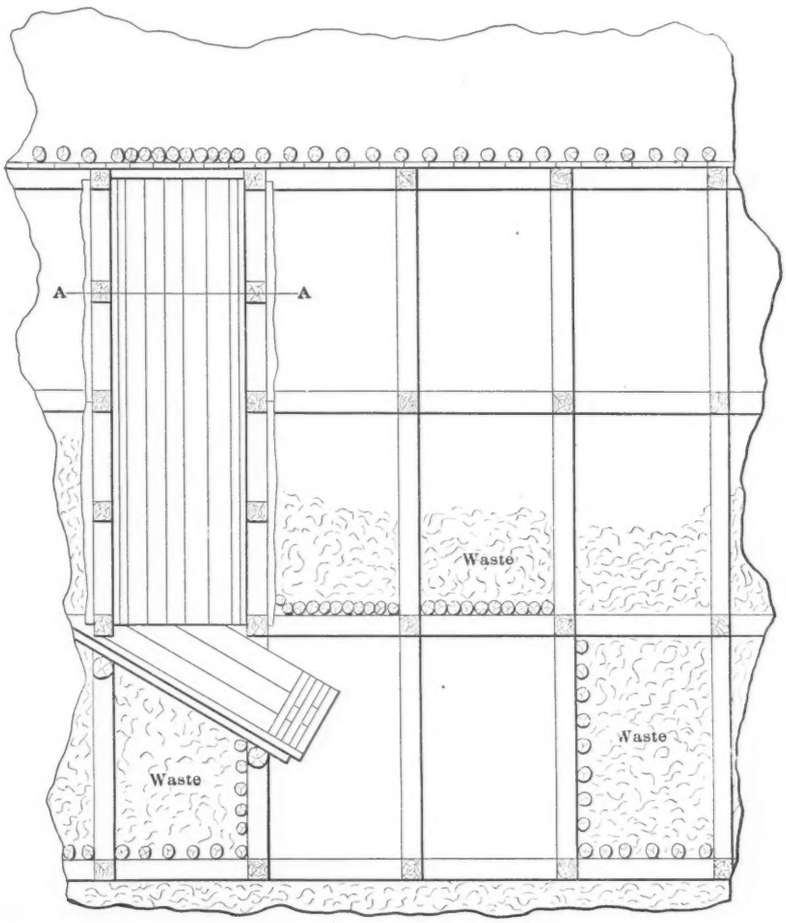



FIG. 2. SQUARE-SET IN A STOPE

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According to the London *Engineer* the accuracy with which drill bits are formed and sharpened has a great influence on the capacity of a rock drill, and since the maintenance of drill steel is one of the most important items in the cost of rock drilling, the use of drill-sharpening machines is recommended. Drills sharpened by machinery are more perfect than those sharpened by hand, and the saving in cost will in a short time pay for the machine. The saving in labor alone is estimated as amounting to at least 65 per cent.

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A writer in London *Engineering* describes a new oxygen breathing apparatus which is intended to start and maintain artificial respiration with a victim of an accident who is so pinned down by timbers or other debris that respiration exercises cannot be resorted to.

# Present Views of Genesis of Leadville Limestone Ores *

By S. F. Emmons

It may be assumed that economic geologists now generally agree, without much qualification, that the limestone ores in the Leadville district were originally deposited—

(1) From aqueous solutions.

(2) In the original form of sulphides.

(3) By metasomatic replacement of the country rock.

## Age

These ores were deposited after the porphyry sheets were intruded and consolidated, but before the dynamic movements produced the great structural faults of the region. Geological investigations made since the original report was prepared have led to the conclusion that the great preliminary fault movement may have taken place at the close of the Jurassic period, or previous to the beginning of Cretaceous sedimentation, and inasmuch as it must logically be assumed that the structural faulting in the Leadville district was contemporaneous with that of the Mosquito fault the ores in limestone may have been originally deposited in pre-Cretaceous time.

It is further recognized that a small amount of deformation of the sedimentary beds must have taken place at the time of the intrusion of the porphyry sheets, which produced some slight folding and fracturing of these beds, and thus commenced the localization of the orebodies.

That there has been movement in comparatively recent times along the great structural faults, as was originally stated, has now been definitely proved. Underground exploration has shown that the comparatively recent rhyolitic tuffs and agglomerates are much more widespread in the district than was indicated on the original map. They have cut through and split important orebodies, but have apparently been confined to the region around Breece hill, and have not affected the limestone deposits in the lower part of the district.

## Distribution of Ore

It was originally assumed, on evidence then available, that the Blue limestone was exceptionally favorable to the deposition and concentration of ore, but it was also stated[1] "that valuable deposits are occasionally found elsewhere, generally along bedding planes or contact surfaces, and less frequently on jointing planes."

Mining developments since that time have shown that the predominance of orebodies along the upper contact of the Blue limestones is by no means so great as was originally supposed, some of the most important ore shoots having been found within its mass at points away from that contact, generally under the sheet of Gray porphyry, but also within the mass of the White limestone. These are locally called second- and third-contact bodies, respectively. Orebodies also occur within the Parting quartzite and in the upper part of the Cambrian quartzite. No important and rich ore deposits have been found, however, within the purely silicious beds at the lower part of the Cambrian, nor at the contact of the latter with the crystalline complex or Archean, such as J. Alden Smith thought would "be extensively and profitably worked for centuries after the contact deposits now operated would be exhausted."

It should be further remarked that the important deposits of gold ore in and adjoining fissure veins in the Breece Hill region are not included in the present discussion, which is confined to the limestone ores treated of in the original report, since their genesis is considered to be distinct and more or less independent of the latter, and will be discussed at length in the general report.

As regards the areal distribution of the principal orebodies, it bears an evident connection with that of the latter intrusive or Gray porphyry sheets, the details of which cannot be finally worked out until the general geological map of the district is finished. It would appear at present, however, that where these intrusive bodies have distinctly broken up from below, across the sedimentary beds, as have those that form the mass of Breece and Dome hills, the ores in limestone tend to form around the periphery of such masses.

## Immediate Source of the Metals

In considering the source of origin of the metallic contents of the ore it seems well to preserve the distinction originally made by the writer between the immediate and ultimate sources, although this distinction has been ignored by subsequent writers. General treatises cannot go into the minute details of structure involved in a consideration of the immediate source, but must be confined to the broader features in their bearing on general theories. Moreover, few, if any, of their authors have ever visited this district, much less made detailed studies of the geological relations of its deposits. On the other hand, the mining engineers, whose opportunities of studying the details of the orebodies that come under their observation were unquestionably much superior to those of the writer, not being professional geologists and having worked in a relatively limited field, may not have noted the bearing on general theories of all the geological facts that came under their observation.

The determination of the immediate source of the ores is important, even though it may not necessarily affect that of the ultimate source, inasmuch as it furnishes data of practical use to the miner in his search for ore. Thus, in the present case, it would appear that the conception of the authors of general treatises who maintain that the ores were brought in by hot ascending solutions from some deep-seated source is that in their upward course these solutions were stopped by a relatively impermeable barrier, in this case the overlying porphyry sheets, and hence spread out laterally, depositing their contents in the limestone underlying these porphyries. In such a case one would expect to find cracks or fissures extending more or less vertically downward from the respective orebodies which might have constituted the channels through which the solutions ascended directly to the porphyry contact.

On the other hand, if the ore-bearing solutions, in the latter part of their circulation or immediately before they deposited their contents in the form of the present orebodies, were moving along the contact planes between porphyry and limestone, they could react on the soluble limestone from these contracts outward and form orebodies, either along the immediate contact or at points within its mass, reached through cracks and joints. On this hypothesis, if most of the contact orebodies were found under the porphyry sheet, the prevailing course of the ore solutions would have been downward, and such solutions might have formed orebodies on the upper contact of a lower sheet, because that sheet presented a barrier to their downward course.

As regards the ultimate source of the ores, while the former of these hypotheses is more peculiarly applicable to the deep-seated source, the latter is not inconsistent with the derivation of the metals from either the barysphere or from igneous masses within limited distances of the ore deposits.

## The Fissure Hypothesis

Leaving entirely out of consideration, for the moment, the question of the ultimate source of the metals, the evidence as to their immediate source must first be considered, since, from the writer's point of view, that is the only one really involved in the criticisms of his original report. In favor of the first, or what might be called the "fissure hypothesis," is the discovery in recent years of deposits coming from or directly connected with vertical fissures in the Breece Hill region, which, however, according to the writer's view were formed in a distinct and different manner from the deposits in limestone in the lower part of the district, which are now under consideration. In the latter deposits the writer has been

*From *Bull.* 320, United States Geological Survey, "Downtown District of Leadville, Colo.," by S. F. Emmons and J. D. Irving.

[1]Second Ann. Rept. U. S. Geol. Survey, 1882, p. 237.

unable to find evidence which seems to him conclusive in favor of the fissure hypothesis, or which might not be as readily interpreted in favor of contact and stratification planes as channels for the ore-bearing solutions.

Cracks and broken or fissured zones are, it is true, found in connection with some of the limestone orebodies, especially with orebodies that have a decided linear arrangement, such as the ore shoots on the South Iron hill, described by Blow. In a broad, general way, these shoots lie in two prominent or major directions—a northwest-southeast direction, which prevails on Iron and Breece hills, and an east-west direction, which is more prominent in the northwest portion of the district. These apparently correspond to those of the axes of slight folding and fracturing that took place about the time of the intrusion of the porphyry. The structural conditions accompanying these fissures do not resemble, however, those connected with the limestone deposits of Rico, Colo., which may be taken as the type of those formed by solutions that ascended through fissures. At Rico the feeding fissures contain well-defined and crustified vein deposits. They end upward at a bed of impervious shale that overlies the limestone, but no limit in depth has yet been found.

Under the shale, orebodies called "blankets" spread out horizontally in the limestone, following a zone that is at some places brecciated along the general direction of the fissures. It has been generally assumed in this case that the ores in the blanket deposits were deposited by waters ascending along the fissures, but Ransome, who made the latest and most detailed study of the district, thinks they are due to the mingling of these with solutions that moved laterally along the blanket zone.

In the Leadville limestone only small cracks have been observed in connection with the orebodies. Many of these cracks are traceable upward from the tops of the orebodies to the overlying porphyry, but, so far as known, do not extend downward much below the workable orebodies. A similar conclusion might be drawn from Mr. Blow's description of the Iron Hill orebodies, for when he prophesies that their extension will be found at a lower horizon, he expects them to go down not vertically but transversely across the stratification, and, as stated above, he believes that the ore solutions entered the limestone along the contacts of Gray porphyry sheets. His improper use of the word "dike" to denote cross-cutting sheets has given rise to the idea that he supposed the solutions to have risen vertically along actual dikes to the present orebodies.

It is evident that the fractures that cross the limestone have played an important part in fixing the location of orebodies and in furnishing channels along which the ore-bearing solutions may pass from one horizon to another, but the general impression produced upon my mind has been rather that they served to divert or temporarily to arrest horizontally moving solutions (especially where, as can sometimes be proved, they are the final result of a strain that produced folding) rather than afforded continuous channels for solutions moving directly upward.

The relative superposition of orebodies at different horizons in a given region is, furthermore, such as to suggest that they were formed by solutions that circulated along contacts and bedding planes, and, incidentally, in joints and cracks that crossed the latter, rather than directly upward through a common vertical fissure that fed a series of superposed orebodies.

There is, moreover, an absence of evidence in the mineralogical composition of the ores and wall rocks that these ore-bearing solutions had temperatures that were high enough to render their direct upward course inherently probable.

### Ultimate Source of the Metals

I do not consider it appropriate in this place to go at length into the theoretical question of magmatic versus meteoric waters, which has been abundantly discussed of late in special articles and treatises, an increasing importance being given by many of our best students of ore deposits to the agency of magmatic waters in the formation of ore deposits which may be genetically connected with igneous eruptions. It seems better to postpone the discussion of the broad question of the ultimate origin of the metallic contents of the Leadville ore deposits until the map of the whole district shall have been completed rather than to attempt it in connection with the present description of a comparatively small portion of the area, in which the oxidizing agents have obscured much of the evidence. The original contention that the ores are genetically connected with the eruptive rocks seems abundantly confirmed and even strengthened by the development of the last 25 years. That their concentration in exceptionally rich bodies has come about through the agency of surface waters is also confirmed, and the study of the sulphide bodies has shown that this secondary enrichment has not been confined to the oxidized zone, but has extended below the ground-water level. The questions still at issue are:

(1) Whether the sulphide ores were originally deposited as a precipitate exclusively from meteoric or from magmatic waters, or in part from both.

(2) Whether the magmatic waters, if they were the transporting agents, reached the present locus of the deposits directly from below, or whether they came up along the general channels that carried the magma of the intrusive rocks, and, where this magma had spread out in sheets between the sedimentary strata, whether they followed in general the contacts between intrusives and sedimentaries or penetrated the mass of the latter along cracks and joints before depositing their load.

(3) Whether the deposits, or any part of them, were formed by contact metamorphism, that is, by waters emanating directly from the cooling intrusive bodies, squeezed out, as it were, from the solidifying igneous mass into the adjoining sedimentary beds.

## Aerolith Breathing Apparatus

By Alfred Gradenwitz*

A breathing machine designed to use atmospheric air and to eliminate the objectionable features of regenerated air,

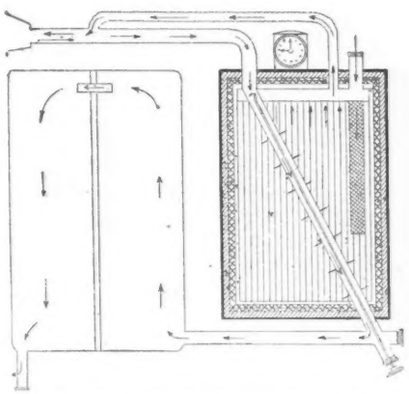


DIAGRAM SHOWING COURSE OF AIR

has been devised by O. Schümann, director of the Hanseatische Apparate-Bau-Gesellschaft, of Hamburg, and O. Suess. The apparatus is called the Aerolith and employs liquid air stored in a reservoir, the air being vaporized and warmed by the exhaled breath during its passage through the machine. The apparatus consists of a reservoir strapped to the back like a knapsack and a respiration bag of air-tight material divided into two compartments. The reservoir is thoroughly insulated without, and is filled with purified asbestos which serves as an absorbent to hold the liquid air.

The reservoir holds about five liters of air, 3½ liters being normally sufficient for about two hours' operation. From the apparatus two lines of tubing lead to the mask covering the organs of respiration. This mask protects the face and other portions of the body from contact with noxious gases and provides for a reliable communication with the interior of the apparatus.

The operation of the apparatus is shown in the accompanying diagram. The expired air after traversing the tube lead-

*Berlin, Germany.

ing to the apparatus, passes through a diagonal tube within the reservoir and yields its heat to the charge in the apparatus. It next penetrates into the first compartment, and finally escapes into the open air through a short tube.

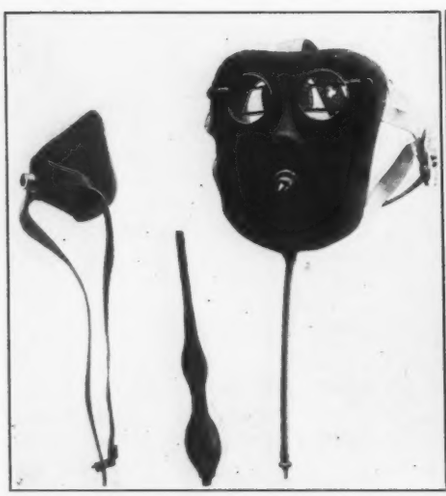
Whenever the man using the machine is under high strain, additional work is also thrown upon his lungs, and a relatively larger amount of heat is carried by the expired air into the diagonal tube for the vaporization of liquid air; this results in a more lively evolution from the reservoir, and furnishes a larger supply of fresh air. In a corresponding manner vaporization will be reduced when the work is of a lighter character. This arrangement, therefore, results in an automatical regulation of vaporization and of the supply as needed.

### Operation of the Apparatus

The air vaporized in the reservoir which contains the fresh supply for respiration traverses a flexible tube about 150 cm. long to the mask. During its passage through this tube owing to the large surface of the latter, it is preheated by the surrounding atmosphere so that the user is not inconvenienced by the intense cold produced in the apparatus. This tube also serves the purpose of preventing direct contact of any part of the charge with the organs of respiration. Even with the maximum charge of about five liters of liquid air the tube is so arranged, that no liquid can escape even when the apparatus is turned upside down.

The diagonal tube is provided with a cleaning slide passing through a stuffing box, by means of which any deposit may be discharged through the cleaning tube. To the two straps of the knapsack is attached by means of hooks a belt and a bag for carrying an alarm clock. In case the operator is provided with a charge for about two hour's work, the clock is set to give the alarm after about 1½ hours.

The apparatus is checked by weight. One liter of liquid air weighs about a kilogram and yields about 800 liters of air for respiration. There is no danger of explosion either in charging or using the apparatus. There are no valves in the interior of the apparatus or in the tubes. The air supplied for respiration is free from carbonic acid. The products of expiration are discharged completely by the continued rinsing action of the air vaporized from the reservoir. Owing to this continual dilution of the air contained in the respiration bag, the accumulated expired air serves as a lock against the outside air and is purified to such a degree, that in case of any sudden extraordinary air requirement the contents of the bag may be breathed repeatedly without risk.



MASK AND ACCESSORIES

RESERVOIR AND CONNECTIONS

## Mining Notes from the Transvaal

Special Correspondence

The Transvaal gold output for October was on the whole very satisfactory. On the all important point of labor, the figures for October show that native labor gained to the extent of 4298 Kafirs, while there was a loss of 3922 Chinese coolies. The unskilled labor force was therefore increased by 376. So far the process of repatriation of Chinese and the replacement by Kafirs has proceeded smoothly.

The first on the list of the producers for October is the Robinson mine, with an output of 25,298 oz.; next comes the Simmer & Jack with 25,068 oz., while third is the Robinson Deep with 19,708 oz. It is interesting to note the sources of yield of the gold, which was as follows: mill, £1,445,245; concentrates, £33,298; sands, £621,191; slimes, £152,460 and through banks, £11,821. These figures show what an economic success the treatment of slimes has become on the Rand. Formerly this material was considered more or less useless. By degrees however, the mines took up the decantation process, and today £150,000 per month is saved from the formerly useless slimes.

A commission of inquiry is now sitting to investigate the possibilities that are offered for the starting up of new industries. One or two industries which made small beginnings are now doing quite well. In Natal and the Transvaal the match industry is forging ahead, while on the Rand the locally made candles are proving so successful that already they supply fully 80 per cent. of the mine trade, and it is probable before long the imported candle will be shut out altogether.

There is always a certain amount of anxiety during the dry season in the Transvaal as to the water supply for the mines, and people are glad to see the first rains. This year the rains have come early and there is every indication of a rainy season, so that there is no fear of scarcity of water.

## The Eastern Coal Company

By J. J. Bell.*

Adjoining the town of Maccan, Cumberland County, Nova Scotia, the Eastern Coal Company is opening and working a coal mine, which promises to become one of the large producers of that Province. The company has acquired from the Nova Scotia Government, a tract consisting of 3840 acres, or 6 square miles. In addition, it owns 52 acres beside the Inter-Colonial Railway, on which it has erected engine and boiler houses, workshops, offices, etc. There are also 15 acres near-by, on which a dam has been built, giving a 12-foot head of water, which will supply the mines and the town of Maccan. Three hundred acres of timber land will furnish mine timber for years to come.

The coal has been pronounced to be of exceptionally good quality. The main seam shows coal 6 ft. thick; then 5 ft. of fire-clay; then 5 ft. more of coal. What is known as the Lawson seam, 60 ft. east of the main seam, measures 5.6 ft. Going east the seams thicken and converge, and there is a possibility that they ultimately unite. These seams are contiguous to the Inter-Colonial Railway, and cars can be loaded from the mouth of the slope. In addition, the Maccan river, which runs through the property, is navigable for vessels of medium tonnage. Shipments have been made by this river to Boston and other New England cities. The company has expended on equipment about $120,000, which gives a capacity of upward of 1000 tons per day.

It is estimated that the three seams, 5 ft., 6 ft. and 5 ft. 6 in. thickness respectively, contain upward of 90,000,000 tons of coal.

*29 Prince Arthur avenue, Toronto, Ont., Canada.

# George Washington Plympton

A Tribute of Justice and Friendship.

By R. W. Raymond.

The death on Sept. 11, 1907, of this my dear friend and colleague of many years, terminated an earthly career of extraordinary—I might almost say unique—influence and usefulness. He was nearly 80 years old when he died; and the 60 years of his active professional career covered that revolutionary and amazing advance in engineering science which has reconstructed the world, and to which he contributed in no small degree.

In this imperfect tribute, I shall try to make clear the grounds of my own profound conviction of the greatness of his character and work. For materials outside of my own knowledge and recollection, I am indebted to many friends, and especially to an appreciative memorial, published in the Journal of the Cooper Union Chemical Society, from which I have taken many data not otherwise accessible to me.

George Washington Plympton was born at Waltham, Mass., Nov. 18, 1827. He was sixth in lineal descent from an English ancestor who came to this country in 1656, and settled in Sudbury, Mass. Of the intervening Plymptons, some distinguished themselves in the Colonial wars with the Indians, and received the honor of a monument, erected in their memory by the town of Sudbury; and 13 of the name are recorded as responding to the call to arms at the time of the battle of Lexington, in 1775. These records, together with the name of George Washington, given by Thomas R. Plympton to his sixth child, bear witness to the American patriotism of the family.

This son's early education was gained in a public school; but, like so many American boys of that period, he was obliged to leave his school-training incomplete, and give himself to a wage-earning occupation in a machine-shop. The notion still lingers here and there among us, that such enforced practice, interrupting, or altogether cutting off, theoretical instruction, is a good thing in itself. This is like the superstition that the endurance of hardship inures a man to further hardship. But we have found out in the field that white men could surpass in this respect the half-starved, half-frozen Indians of the plains and that in the war of the Rebellion recruits drawn from the comparatively comfortable life of the city could stand more of fatigue and deprivation than those who came from the strenuous training of farm-labor. The truth seems to be that foregoing severities of experience do not strengthen men, but simply, that they sift out the weaker men, so that, on the whole, the strongest only survive—though even these are not as strong as they might otherwise have been. We may say, in like manner, that deficiencies of early education and the necessity of self-help are not in themselves advantageous; but that those who defy and overcome them are likely to be men of strong, resolute character and high ambition. The fact that "self-made" men always try to give to their sons the early advantages which they could not command for themselves, is an additional proof of this proposition. Moreover, it is easy to over-estimate the scope of school-training. To some young men, it is invaluable, and the lack of it can never be made up. Others already endowed with the gift of intelligent study and the art of dealing with men, easily replace, during the years of practice, what they did not learn in school.

To this class Plympton belonged. During his work as a machinist, he mastered, by private study, geometry, trigonometry, and other branches preparatory to a regular course in civil engineering—the profession upon which he had set his heart; and, no doubt, he also saved money for the service of his cherished ambition. At all events, he was graduated in 1847, at the age of 20, with the degree of C. E. from the Rensselaer Polytechnic Institute at Troy, N. Y., then almost the only, and still a highly efficient and deservedly famous American school of engineering. The rank of his proficiency may be inferred from his immediate engagement as an instructor in that institution—a position which he occupied for a year, and which he left to undertake important engineering field-work. In the service of the States of Massachusetts and New York he surveyed a considerable part of the Adirondack region, and laid out many of the roads which still remain between New York and Albany.

In 1851 he became professor of engineering and architecture in the University at Cleveland, O., and in 1853, professor of mathematics in the State Normal School at Albany, N. Y. By genius and temperament, he was qualified to become an eminent mathematician. The president of a leading American college once said of him, "His intuitive perception of mathematical relations is greater than that of any man I ever knew;" and to this opinion I can give my own hearty assent, with the qualification (offered with some hesitation) that, so far as I knew him, his mathematical genius was analytical, rather than graphic. In view of the limitations of my experience with him, it would probably be fairer to say that, if he "took to" descriptive geometry as naturally as I know he did to algebra, he must have been an all-round master of mathematical science.

But his practical experience had already given him a strong impulse toward applied science; and his work in the laying-out of roads, as the first step toward the conquest of the wilderness for civilization, led him to take special interest in the building of bridges, as the second step. In and after 1852 he devoted special attention to this department of engineering, his thorough mastery of which was recognized by his innumerable pupils in later years.

Even at this early period of his career, his peculiar ability and mission as an instructor was recognized by others and forced upon his own consciousness. In 1859 he was proposed as director of his *alma mater*, the Troy Polytechnic, but declined to be a candidate. In 1860 he accepted the chair of mathematics in the Normal School of New Jersey. In 1863 he resigned that position, to become professor of the physical sciences in the Brooklyn Polytechnic Institute—a place which he occupied for 42 years, until, in 1905, he was made professor *emeritus*.

In his work as instructor at the Polytechnic, Professor Plympton exhibited in high degree his peculiar ability to stimulate and inspire his pupils. It may fairly be said that in many departments, and especially in those which concern rudimentary knowledge, the future usefulness of which is not immediately obvious to the young student, the teacher's greatest difficulty is to make the necessary initial drudgery interesting to beginners who do not appreciate its value. No pupil of his ever presented that difficulty to him. While he was still carrying his students through the alphabet of science, he began teaching them to spell. A happy instance of his method, accidentally made known to me, is the way in which he was accustomed, in connection with his course in physics, to induct his classes into the mysteries of legerdemain, of which quasi-scientific art he was himself an accomplished practitioner. Those who are acquainted with the history of this art need not be told that such masters as Houdin made use of the latest scientific discoveries in magnetism, electricity, etc., for the working of their seeming miracles, and that the marvels not thus to be accounted for were tricks, performed by skilful hands in the presence of untrained observers. Indeed, when I note how many honest, good, even scientific people, are continually deluded by such "occult" performances, I am almost ready to declare that instruction in legerdemain ought to be a part of every course in physical science. At all events, Professor Plympton made it incidentally a part of his course; and I remember with pleasure the account he once gave me of a couple of his students who, upon their graduation, made a journey to India, and, being amply furnished with money, made it their business to see, at any cost, the best that Indian magicians had to show; and who, after their return, reported to him that they had witnessed absolutely nothing which they were not

able, through the previous instruction received from him, to detect at once as a mere trick—and, in most cases, a very clumsy one. Plympton, in telling me of this incident, connected it with the historic encounter between Houdin and the magicians of the East, in which the French expert not only divined and reproduced all their miracles, but performed others which they could not copy or explain.

Meanwhile, he accepted and discharged with exhaustless energy, fidelity and enthusiasm, other important responsibilities.

In 1869 he became professor of chemistry and toxicology in the Long Island Hospital College, where he lectured on these subjects until 1885, receiving from the College, in 1880, the honorary degree of M. D. (not often conferred by such institutions), and, upon his resignation, the title of professor *emeritus*.

From 1870 to 1886 he edited *Van Nostrand's Engineering Magazine*, which was, until the death of its founder caused its suspension, a leading organ of American engineering. In the course of his journalistic work, Professor Plympton not only furnished to American readers many original suggestions from his own knowledge and experience, but also made available to them by translation, or judicious selection and condensation, the most important contributions of foreign authors to current technical literature. On one occasion, it is said, he discovered, after partly translating a German article, that it was nothing more than a German version of an earlier article of his own! While I do not vouch for this story, I thoroughly believe it; for I remember a similar experience, when my translation of a foreign article, prepared with much grateful enthusiasm, because of its corroboration of my own views, was returned to me by my American publishers, together with my American original!

During his connection with this magazine, Professor Plympton edited many editions of American and foreign treatises, and published several manuals of his own on practical engineering. In the former class I may name the well known works of Prof. W. H. Corfield, of University College, London, on "Water and Water Supply;" M. W. Baker, Associate Editor of *Engineering News*, on "Sewerage and Sewage Purification;" P. H. Philbrick, on "Beams and Girders, with Practical Formulas for Their Resistance;" A. Bourgougnon, on "Physical Problems and Their Solution;" E. Sherman Gould's "Primer on the Calculus;" and especially the treatise of Prof. E. Jannettaz, which he translated from the French and published under the title "A Guide to the Determination of Rocks, Being an Introduction to Lithology." In the latter class, I may name his excellent little book, "How to Become an Engineer," and his manual on the aneroid barometer and its use, which, I am told, is now in its ninth edition. But, under both heads, I am keenly conscious that the list I have given is deplorably incomplete.

During this period also, I know that he was connected as consulting engineer with important undertakings, one of which was the great scheme for the drainage and reclamation of the "Jersey flats," still in progress. And I was myself associated with him in professional investigations and reports which made known to me his acute and comprehensive knowledge and his sane judgment concerning engineering theories and enterprises.

In 1885 he was appointed by the governor of New York State, upon the recommendation of the mayor of Brooklyn, a member of the Commission of Electrical Subways for that city (not yet incorporated into "Greater New York"). That commission existed four years. It was confronted at the outset with an impossible task—namely, the putting underground of all electrical conductors before a certain early date. In dealing with this problem, it encountered and defeated the schemes of sundry politicians and inventors, many of whom were more successful in what was then New York City. Without surrender to these interests, or compromise with them, the Brooklyn commission, during its four years of life, caused to be put underground a number of miles (about 8000) of electrical conductors equal to the total number existing above ground at the date of its creation. Moreover, it devised, and induced the principal electrical companies to adopt, a system of underground conduits not covered by anybody's patents, yet notably free from the difficulties and dangers which attended the system adopted on the other side of the East river.

In the working out of details, Professor Plympton freely placed his scientific knowledge and mechanical ingenuity at the service of the electrical companies; and, although, together with his associates, he was the victim of some newspaper attacks, inspired by disappointed schemers or theatrical "reformers," who professed to regard an expert "incompetent," if he refused to attempt the impracticable, or to perform instantly even the practicable, the sequel vindicated both his integrity and his wisdom. In 1892, when a new subway commission, having the same powers as the old, but consisting of two persons only, was appointed by a (Democratic) Mayor, Professor Plympton was made the technical expert member (his associate being a lawyer); the appointment was universally recognized as appropriate, not to say well-nigh necessary; and, in this capacity, he carried out, with undisturbed serenity, the patient and careful policy for which he had been savagely attacked not long before. The question was no longer a "burning" one; politicians had forgotten it; journalists found no "news" in it; and he was left in comparative peace and freedom to deal with it as a scientific problem and a public duty.

Meanwhile, he had received in 1890 (immediately after the termination of the first subway commission) the significant honor of an appointment as one of a board of engineers to consider the improvement of the terminal facilities of the Brooklyn bridge.

But these multifarious activities are eclipsed by the record of what must be considered, after all, as the great work of his life. In 1869 he became professor of physics and engineering, and in 1879 director of the night classes, in the Cooper Union of New York City; and in 1901 he retired from active work in the Brooklyn Polytechnic Institute, to take charge of the Cooper Union day schools also—a position which he continued to hold, discharging its duties with unfailing ability and tact, and exhaustless energy, as long as he lived.

The board of trustees of the Cooper Union, at its first meeting after his death, adopted the following minute:

**After an illness of several months, on September 11 last, at his home at Tyson, Vermont, died Prof. George W. Plympton. Professor Plympton participated in the commencement exercises at the close of the last Cooper Union term. There was nothing at that time to indicate that he was not in his usual good health. His illness began early in the summer. His death was unexpected, although it had been known that he would not be able to resume his duties at the beginning of the present term.**

**Professor Plympton became professor of physics and engineering in Cooper Union in 1869. In 1879 he became director of the night classes. In 1901 he gave up his position with the Brooklyn Polytechnic Institute to become director of the day school of science and art, and this position he held until his death.**

**It is difficult to conceive of the Cooper Union without Professor Plympton, and it is difficult for those who had become accustmed to his connection with the institution to realize that it has come to an end. His attachment to the Cooper Union was unabated from the beginning of his connection with it. He gave to it the best of his time, of his ability and of his extraordinary fitness for the work. No temptation was sufficient to induce him to leave, and no burden of work ever elicited from him a complaint. He was a veteran member of the Society of Civil Engineers, and has received many honors from scientific bodies. His distinguished reputation as an engineer became established at an early period of his life. He was the author of many articles and works on scientific subjects, and a translator into English of others. Personally Professor Plympton was a most genial and lovable man. He was possessed of an even temper, was capable of inspiring warm enthusiasm in his students, and equally to the officers and trustees of the institution, and to the students he had attached himself by ties, the severance of which it is hard to bear. He was at the last meeting of the Alumni Association on Founder's Day, spoke with all his usual vigor, and then, as always, made it difficult to comprehend that he had reached such an advanced period of life. The trustees extend the warmest sympathy to the surviving members of Professor Plympton's family, and direct that a copy of this minute shall be furnished to them.**

To this well-deserved tribute, I cannot forbear to add my own testimony, based upon a personal association with Professor

Plympton for 20 years in the work of the Cooper Union. Perhaps I should explain that my position during this period was simply that of the personal representative of Hon. A. S. Hewitt, the secretary of the trustees, and executive manager of the institution. In this capacity, I directed, with Professor Plympton's efficient aid, the courses of free Saturday evening lectures (perhaps the first of their kind, certainly for many years unique in New York City, and ultimately the basis of the admirable system now maintained on a much larger scale, by the New York Board of Education); and I enjoyed unlimited, though indefinite, powers of inquiry into all departments of the Cooper Union.

In my "Life of Peter Cooper" I have said, concerning the history and character of this institution, many things which need not be repeated here. I need emphasize only, at this time, two indelible impressions which I received from my own experience with it.

The first was my overwhelming realization of the existence, in the metropolis of America, of a great university, operating chiefly (though not wholly) by night; crowded with thousands of intensely earnest students, and beset by equal numbers of waiting candidates; absolutely free from all such difficulties of discipline as afflict, from time to time, our educational establishments (for the simple reason that any discontented or troublesome student could be asked to give up his place to an eager substitute); accommodating its facilities to the pressing demands of special students, yet maintaining, nevertheless, a complete curriculum for such as could pursue it; and turning out, among its graduates, men of commanding ability and comprehensive accomplishments. In those years I repeatedly conducted, at night, through the class-rooms of the Cooper Union, visitors from other cities or countries, and enjoyed their surprised admiration of the great work, then almost unparalleled in the world; and I was perpetually amazed that the citizens of New York remained so unconscious of its importance and so indifferent to its success. Time has altered the situation. The example of the Cooper Union has been imitated in many other places; and that pioneer institution has received, besides the generous gifts of its founder and his family, contributions from other sources, greatly augmenting its means, though not exceeding the requirements of its maximum efficiency. Nevertheless, it will be forever true that Abram S. Hewitt and his associates, supported in their administration by the venerable founder himself, gave to it the form and direction which made it what it is, and what it is destined to become.

The second indelible impression which my service in the Cooper Union has left upon me is that of the quiet, tactful, thorough management, by Professor Plympton, of all the departments under his control, as well as the sympathetic and inspiring nature of his instruction in those departments which he personally conducted as instructor. I cannot recall from the twenty years of my association with him in this work, a single instance in which his action occasioned administrative embarrassment to the trustees, or his judgment was overruled by them. There were, of course, difficulties and perplexities enough; but, so far as I can remember, not one of them originated in personal pride, sensitiveness, obstinacy, mistake or misunderstanding on the part of Director Plympton. I may safely leave it to the harassed presidents and trustees of American colleges generally, to characterize a record like that!

The great secret of this extraordinary administrative success was undoubtedly the man's invariable mood of courtesy, sympathy and self-control. Anger always clouds the judgment, and complicates the situation. Now, I never saw Professor Plympton angry—not even when, as the head of the Brooklyn Subway Commission, he was scurrilously attacked, and I, as his colleague, was righteously angry for him! Nobody at the Cooper Union, so far as I can learn (and my experience is corroborated by the testimony of those who saw him every night for some thirty years of his service there), ever saw him angry. And, most wonderful of all, he was equally gentle and equable at home. His son, a man of mature age, says *he* never saw him angry! I emphasize this feature of his character, not by way of preaching or eulogy, but from the standpoint of an engineer, as an illustration, almost unique in my observation, of the saving of energy, the avoidance of "waste motion" through intellectual error, and the increased efficiency and durability of work and influence, through the maintenance of an absolutely constant temperature of mind and heart. Those of us who need to be excited before we can "do our best" are not really ever doing our best. The feverish is not the most forcible. The western phrase, "He did his level best," has a deep philosophy in it; for it characterizes the man upon whose strength we can always place our reliance—the man who is always "in good form" for his task, and ready to discharge it with elastic readiness and complete command of its requirements.

I must mention here, as an additional item in the already astonishing catalog of his numerous occupations, one of his many functions as director of the Cooper Union—a function officially unrequired and unrecorded, and voluntarily assumed. Namely, he used to receive, hear and advise all sorts of inventors and "cranks," presenting more or less revolutionary novelties in scientific theory or practice. Such folks not only drifted to him; they were also referred to him by those who wished to get rid of them. Discoverers of devices for perpetual motion, squarers of the circle, etc., etc., as well as the inventors of devices less clearly, though not less really, absurd, inflicted themselves upon him. From the stories of such experiences which he told me from time to time, I infer that perhaps nobody ever surpassed him in the patient courtesy and secret amusement with which he received and enlightened such crude enthusiasts. The only precedent known to me is that of the Oxford mathematician, Professor De Morgan, whose contributions to "Notes and Queries" (published after his death in that delicious, and now scarce, book, "A Budget of Paradoxes") show what delight he felt in dealing with the queer propounders of eccentric doctrines. The difference is, that Plympton never published the crude notions of his visitors, together with his own witty refutations of them, but simply tried, as a friend, to correct their errors, and guide them to more thorough study of principles.

The foregoing sketch of his multitudinous and often mutually "overlapping" occupations may well excite surprise. I can remember a time when he used to leave home at 7.30 a. m.; go by horse-car to his duty at the Brooklyn Polytechnic; thence to the Long Island College; thence to his editorial work at Van Nostrand's, and finally to his night's service at the Cooper Union, after which he reached home between 10 and 11 p.m., to repeat the same program on the following day. On Saturday night, however, he permitted himself to break through this rigid routine; and in the memorable, happy days when the *Century* still had its house in 15th street, he and I used to enjoy, that night, an hour of relaxation, before returning together to Brooklyn. As a general rule, he could be found, during this hour, playing billiards—a sign, as I have always thought, of the need, to a mind long strained, of radical and restful change. Yet, on the journey home, much longer in those days than now, he was as freshly appreciative and suggestive as if nothing had happened during the week to make him tired.

Apart from his native gifts, the chief factor of his enduring, versatile intellectual vigor was, as I have indicated, his genial temperament. But, on the physical side, his sound health and regular, temperate habits must be taken into account. One of the habits which played no small part in the maintenance of his powers was that of spending the summer vacation in complete rest and out-door recreation.

Thus he lived, in elastic and inexhaustible youthfulness, for 80 years.

Thus he carried to the last his intelligent acquaintance and sympathy with all scientific progress, and his spontaneous, unselfish readiness to aid the endeavors and recognize the achievements of his pupils and his fellows. Thus, at last, he crowned a greatly useful life with a peaceful death, leaving behind him not only the monument of many works well done, but a higher memorial in the grateful love of multitudes, through whose lives his stimulating and guiding influence will find expression for a generation to come.

## The Search for a New Stope Drill for the Rand

An historical review of attempts to find a successful and economical small power drill for use in stopes, and a summary of recent progress in this line appeared in *South African Mines,* (Sept. 14, 1907). The first so-called stope drills were brought out about 1880 and were virtually models of larger sized air-power drills. These stope drills weighed about 90 lb., had 1¾-in. cylinders and 4½ to 5 in. stroke. They could drill holes up to about 18 in. deep.

### "Baby" Stope Drills

These "baby" stope drills first appeared on the Rand between 1896 and 1899, and were hailed with great delight by mine managers; but when the question of actual rather than virtual economy was looked into, it was found that the total cost of maintenance and air power for these small drills more than off-set the extra work which they accomplished. Practically all experiments with "baby" drills were unsuccessful, but nevertheless they were continued in use up to about 1906.

### Hand Hammer Drills

In 1904 a new type of machine, a hand hammer drill, was introduced on the Rand. This drill, as first applied, was nothing more than a hand pneumatic chipper, such as is used in ship-yards for chipping and riveting steel plates. It weighed about 20 lb. and was claimed to be able to drill a 3-ft. hole in the typical banket reef in 15 to 20 minutes on about a tenth of the air power required by a large machine drill. A native was supposed to handle the tool and drill at least eight holes per shift. The first lot of drills were put to work on the New Kleinfontein and here they were a success; a second lot of drills was purchased, but all were subsequently scrapped. The real cause of the failure is uncertain, but none of these drills is in permanent use at the present time. Other forms of hand hammer drills that were subsequently tried experimentally also failed to prove successful under Rand conditions.

### Reasons for Failure

The failure of all these hammer drills was usually due to the machines being designed in a drawing-office by people who presumably knew little or nothing about underground conditions, hence they were either trappy and broke incessantly, or they were not nearly powerful enough for Rand conditions. Most of them proposed to drill without water, and the dust thus created would surely have given the operator phthisis inside of 60 days. To use water one maker screwed a nipple into the steel, which was perfectly impracticable, as well as unmechanical, and another proposed a 48-in. high hot water tank with gasolene torch. (It was to be set up in a 36-in. stope).

The old and much-abused "baby" stope drill of the percussive or big drill type, is being once more brought forward; among the various makes may be mentioned the Little Imperial, Little Holman, Little Hercules, Little Kid, Little Wonder, Baby Ingersoll, Little Konomax, Little Bantam, etc. Most of these machines have been still further reduced in weight than the 90 lb. of 1880 and 1896. Certain changes looking to improvements have also been made, and taken as a whole the machines in the field and ready to compete with the native are at first sight as attractive as ever.

In general design these various "baby" stope drills of the air-driven percussive type are more or less alike in that they are all working models of the large 3¼-in. machine drills in vogue. Their weight varies between 70 and 100 lb. stripped, and their cylinder dimensions vary between 1¾ and 2¼ in. in diameter. No absolutely fair or even reasonable comparisons can be made of the work done by the various makes now being tried, reports of test runs on different mines varying from 18 to 50 ft. of hole per shift. In a general way it is fairly safe to say there cannot be much real difference between any of them in work done, the makers' claims notwithstanding, and that 20 to 30 ft. of hole per shift would be fairly good average work, depending on the hardness of the rock, the air pressure, etc. They all require two natives to operate them, take about half the air required by the large drills, and drill holes 3 ft. to 4 ft. 6 in. deep. In only one instance is there a variation, and that is in the style of drill steel employed, the Little Imperial using hollow steel through which a portion of the motive fluid passes to blow the rock cuttings out of the hole. To allay the dust thus created a water spray attached to the machine is played around the mouth of the hole.

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The total copper production of Russia for the first seven months of 1907 was, according to *L'Echo des Mines,* 8249 metric tons against 10,177 tons for the entire year 1906.

## Magnesite

By Charles G. Yale

The magnesite deposits of California, the only ones commercially utilized in the United States, showed little or no change in 1907 from what they did in the previous year. Two new deposits became productive during the year, one in Sonoma and the other in Tulare county, but their combined output was small. A deposit was also found in Riverside county and a company organized to open it, but thus far there has been no output from it. Most of the magnesite in California comes from the deposits in Tulare county, near Porterville, where it is mined very cheaply by quarrying, and it can be shipped by rail to San Francisco at low cost. Calcining furnaces have been built at that point and the product sold to paper manufacturers who use it in wood-pulp manufacture. The manufacturers of carbon dioxide obtain their crude magnesite from both Tulare and Sonoma counties, and they also sell some of the calcined material to the papermakers.

The deposits in Alameda county, which extend into Santa Clara and Stanislaus counties, are utilized by a company which has a manufacturing plant in Oakland, where some building material and brick are made, but only on a large scale. The consumption of magnesite produced in California is confined to the Pacific coast, as freight rates eastward are prohibitive, when the material must meet the competitive price of the Austrian and Grecian magnesite.

The output of California is never above 8000 tons crude and is usually less than that. The crude may be considered as worth about $3 per ton, or less. The calcined is worth less than formerly; at present about $12 per ton. Experiments are being made with calcined magnesite as a base for tiles, which, if successful, may cause a greater demand for the material. There are many known deposits of the mineral in California, but generally speaking, only those are utilized which are near the railroad lines, where cheap transportation may be obtained. The consumption is too limited to admit of many deposits of this mineral being advantageously worked.

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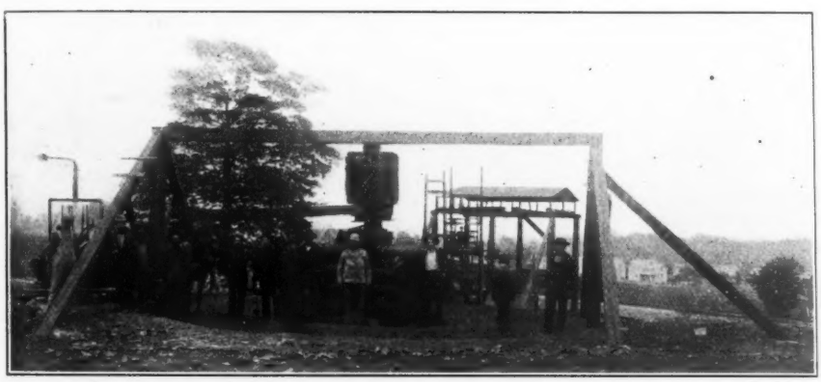
Cobalt, so closely associated in nature with nickel, is not used in the metallic state, but cobalt oxide finds use as a dye. At Cobalt, Canada, cobalt occurs with silver in large amounts, but only one company is known to save the cobalt content of silver ores. Experiments have been made with cobalt ores as an alloy for steel, but none of them have been so successful as to justify the manufacture of cobalt steel.

# Sinking the Clonan Shaft at Mineville, N. Y.

By Guy C. Stoltz*

The Clonan shaft is being sunk on the property of the Port Henry Iron Ore Company, Mineville, N. Y., to handle that part of the large magnetic ore deposit lying in mine No. 21. In order to handle 1500 tons per day the shaft is to be sunk 500 ft. vertically and crosscuts will be driven at 80-ft. intervals to the orebody. Fig. 1 shows the whim which was built for temporary hoisting, a temporary 50 h.p. Ledgerwood hoisting engine in the foreground, and the head frame of the shaft in the background.

Sinking had been carried to a depth of 50 ft. through drift almost free from boulders, when a flow of water was encountered. A pump was installed and the water was taken care of, so that sinking progressed with but little delay during one shift. Anticipating a water flow near the ledge since the site was swampy, the shaft had been cut about 3 ft. longer in width and length than the shaft sets required, leaving a rectangular space 1.5 ft. wide, which could be filled with concrete. The ground did not stand well, so to prevent caving in against the lagging of the regular set and blocking of the space for the concrete filling, planks were put out against the drift and held in place by struts.



TEMPORARY WHIM, CLONAN SHAFT, MINEVILLE, N. Y.

On reaching the ledge concreting could have been started but for the seamy character of the gneiss which made it advisable to sink further into the ledge in order to get a foundation for the concrete wall that would be below any seams carrying water. At a depth of 80 ft. the country rock was less seamy. Here the shaft was squared up, all loose material hoisted and the shaft sets, well lagged, were hung to within 3 ft. of the floor. Two-inch hemlock plank were cut to length and reached from the last set to the floor, thus completing the form for the enclosing filling of concrete. Where the set lagging did not match well, the cracks were lathed to prevent loss of the concrete, which had to be thin enough to fill the seams in the gneiss, some of which had been made larger by blasting.

To make the wall watertight only the best of material was used. The sand in the vicinity was loamy and consequently quite unfit for making concrete. Tailings from the magnetic separating mills of the Wetherbee Sherman Company were, therefore, employed. The tailings used were undersize from 6-mesh screens and were mixed in the proportion of 3 to 1 with portland cement.

### Handling and Pouring the Concrete

The concrete was delivered to the bottom of the shaft, through a 10x10-in. chute, fastened in one corner of the shaft to the wall plate and end piece, falling into a box 4x5x1 ft. Four men shoveled from the box, throwing the concrete behind the sets through openings made by taking away occasional lagging planks. When a distance of 2.5 ft. had been filled on all sides, the lagging was replaced and alternate planks were taken off of the next set above, to allow feeding in the concrete. The receiving box and the necessary staging were moved up a set interval and filling continued as before until the collar of the shaft was reached. The struts and the plank holding the drift sides of the shaft in place were removed and all the loose drift which fell was hoisted. The concrete wall was well washed to make sure that no layers of clay had been inclosed.

Concreting was carried on during all shifts, but no Sunday work was done. Near the end of the Saturday night shift the wall was squared on all sides. The first shift on Monday covered the wall with a ¼-in. layer of grouting before filling in with concrete. To add to its impermeability the concrete was thoroughly tamped throughout each shift, and a very small amount of slacked lime was added to each batch. Broad-faced and light-weight tamping sticks were found to be the most satisfactory for tamping so fluid a mixture.

The percentage of water which works its way through the walls is small. By fastening 1x1-in. grooved wooden strips to the wall plates and end pieces, the water is carried to one set of timber where it is caught in a tin spout and delivered to a barrel in the manway compartment. A hand pump is to be installed at the shaft collar, and the water is to be used for drinking purposes.

The work was somewhat handicapped by not having on hand a mechanical mixer. However, by using two mixing boxes 4.5x7x1 ft. each, served by three men, a shift frequently turned out 35 cu.yd. of concrete in 9½ hours.

After the concrete wall had become sufficiently hard, sinking was resumed. In order to blast and yet not fracture the wall, a smaller rectangle than that required by the shaft sets was blasted out and carried to a depth of 5 ft., when the usual size of the shaft was taken up and carried about 5 ft. farther. Then numerous pop holes were put into the extra shoulder which had protected the concrete bearing. They were loaded lightly and fired, thus trimming the shaft to the required size.

### Timbering

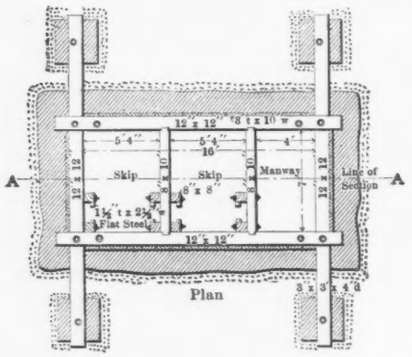
The three-compartment shaft shown in plan in Fig. 2, has two skipways 5 ft. 4 in. wide by 7 ft. across skips, and a manway 4x7 ft. Three-ton skips will be used. The vertical distance between stations in the manway compartment is 14 ft., the ladders standing at an angle of 60 deg. with the horizontal, making it easy to climb and have a free hand to carry articles. The dividers 8x10 in. act as a guard rail at the station platform. The ladders have 4x4-in. sides, with ⅝-in. iron rungs and are arranged so that an end elevation would show all ladders parallel. The wall plates, end pieces, four corner posts and two wall-plate posts are of 10x10-in. Georgia yellow pine.

Both the front and guard stringers are 8x8-in. sticks bolted to the dividers. The stringers will be fitted with flat steel 1½ in. thick and 3 in. wide. The shaft timbers are hung by 1¼-in. iron from 12x12-in. bearers, the bearers resting on concrete piers, placed a safe distance from the shaft.

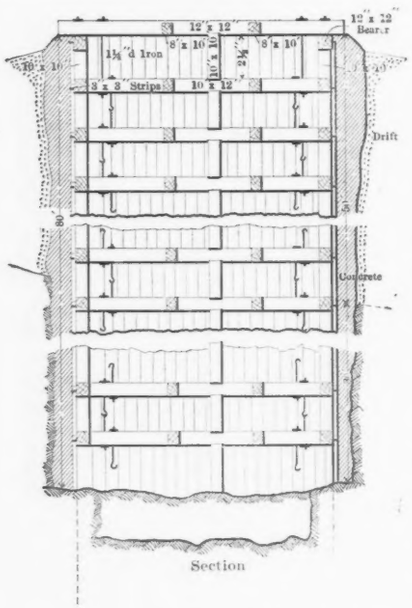
Through the drift and seamy ledge the sets were placed 2.5 ft. apart, but as sinking progresses 6-ft. corner posts are being used, the center posts are omitted. The shaft sets will be well wedged in place against the walls and at a proper interval hitches will be cut and bearers introduced to take up the weight of that section of timber hanging from the bearers above. By this method the hanging bolts of a completed section can be taken out and used in hanging the timbers of the next section, and so on for 500 ft.

*Chief engineer, Port Henry Iron Ore Company, Mineville, N. Y.

Two machine men and three helpers and one extra man form a shift. The members of our shift put down a round of holes, say 9, in one half of the shaft and fire; as soon as the smoke has cleared, they begin to muck. The men of the next shift finish mucking, drill a round in the other half of the shaft, fire and then muck. After trying out several other methods of organizing and arranging the work of each shift, this has been found to be the




PLAN OF SUSPENDED SETS, CLONAN SHAFT




SECTION OF SUSPENDED SETS IN CLONAN SHAFT AT MINEVILLE, N. Y.

most satisfactory. The rate of sinking for September, working two 10-hour shifts (no Sunday work), was 30 ft. total depth.

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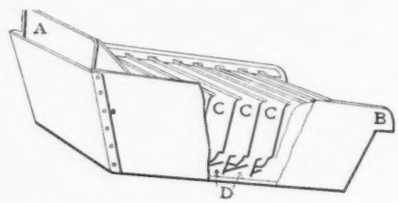
Recently the idea has been proposed of making cyanide at the spot where needed, by the fixation of atmospheric nitrogen. Such a method would have the advantage of producing the cyanide already in solution. The important point to be settled is whether the saving in solidifying, packing and shipping cyanide will offset the probable greater cost of the electric plant for the fixation of the nitrogen.

## The Pierce Amalgamator

In the attempt to attain a better recovery of gold from mills, cyanide works, and more especially from placers in which the gold is very fine, or covered with a film of iron oxide, L. S. Pierce has developed a new type of amalgamator. This device is adapted to treat only fine material, and so when the amalgamator is used in connection with sluices, a system of grizzlies and screens removes all coarse material and delivers to the amalgamator a pulp of properly sized particles. It is also claimed that this amalgamator may be advantageously used as a substitute for plates in front of stamp screens, or even as a supplementary amalgamating device at the end of the plate and the quicksilver traps.

The construction of the apparatus will be understood by reference to the accompanying figure. The upper riffles *C* are made of wood or any suitable substance, but are preferably manufactured from




THE PIERCE AMALGAMATOR

copper. These riffles extend below the top of the lower riffles *D*, which are bent back at the top in the direction of the flow of pulp and at the bottom are turned toward the flow so as to form a small trap for the quicksilver. As material is fed into the amalgamator through the box at *A*, it fills the space in front of the first riffle up to the top, then passes over it, down to the lower riffle *D*, goes under this riffle, and then up between the first and second upper riffles, to the top, and so on. The theory of the process is that the water passing down between the riffles keeps the black sand and flour gold agitated and by sweeping them against the surface of the amalgamated copper riffles *C*, the fine gold has a chance to be caught by the plated surface. So much chance is offered the flour gold to strike against the amalgamated surface during the passage of the feed through the whole length of the box that a high percentage of extraction is claimed. Coarse and rusty gold is saved owing to the fact that when it comes into contact with the quicksilver bath at the bottom of the riffles *D* it will sink below the surface on account of the superior specific gravity of the gold. It is this special feature which it is claimed will save gold which would not be caught in the ordinary riffles and mill plates in a stamp mill.

## Determination of Sulphur

By A. C. DeJongh*

The usual method for determining sulphur in ores, etc., is very tedious and laborious when silica is present together with metals, such as lead, zinc, etc., which may form soluble compounds with the alkalies. It is usual to remove these heavy metals from the solution by passing carbon dioxide through it and then filtering; but it is still necessary to evaporate the liquid to dryness in order to get rid of the silica. Fairly accurate results may be obtained by using the following method, which does away with all evaporation and with the greater part of the filtering. The entire assay, from the weighing of the substance to the calculation of the result, may be finished within an hour.

The ore, or other substance, is fused in a nickel crucible with sodium peroxide in the same manner as described for tin ores by Messrs. Darroch and Mieklejohn in the Journal of June 23, 1907. I have found it advisable to dilute the sodium peroxide ($Na_2O_2$) with about an equal part of potassium carbonate. This prevents the building of crusts and the fused mass, after cooling, can be brought into solution in a minute or two, by simply filling the crucible with cold water. The contents are then transferred to a 200-c.c. flask and agitated with about 20 grams of ammonium chloride. The direct result is a complete and simultaneous precipitation of silica and lead, together with any other interfering metal. The addition of a small particle of ammonium nitrate seems to hasten the reaction considerably.

The flask is now filled to the mark and then one-half of the liquid is filtered off, through a dry filter, into a 100-c.c. flask; the rest may be thrown away. The solution is then made acid with nitric acid, boiled and the necessary quantity of boiling barium chloride solution is added. The presence of a minute amount of ammonium nitrate, as mentioned above, accelerates the precipitation of barium sulphate; after two or three minutes, the solution can be decanted. A large excess of nitric acid in the liquid must be avoided because it raises the solubility of the barium sulphate.

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The increase in the production of copper in Japan is reflected in the figures for the export of copper during 1906. The exports to various countries are given as follows, in value: United States, $1,315,000; China, $2,275,000; Germany, $1,220,000; France, $1,095,000; Italy, $375,000; United Kingdom, $2,499,000; Hong Kong, $3,358,000. The total exports of copper are given as 33,704 tons, valued at $12,803,000 for the year.

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*Mining engineer, Nijmegen, Holland.

# Lake Superior Iron Mines in 1907

## Operations in Region Which Has Furnished 379,663,000 Tons of Iron Ore to Our Blast Furnaces. Back-bone of American Iron Industry

BY DWIGHT E. WOODBRIDGE*

Including all-rail, Lake Superior iron ore shipments for 1907 were approximately 42,000,000 gross tons. This compares with a series of previous years as follows:

| | | | |
|---|---|---|---|
| 1888 | 5,063,877 | 1992 | 27,571,121 |
| 1890 | 9,003,725 | 1904 | 21,822,839 |
| 1895 | 10,839,037 | 1906 | 38,393,495 |
| 1900 | 19,959,393 | 1907 | 41,817,325 |

It is estimated that all-rail shipments this year amounted to nearly 1,000,000 tons. There were shipments of about 50,000 tons from Baraboo and not far from 180,000 tons from Canadian mines, the Michipicoten and Atikokan regions.

### Production of the Ranges.

The division of shipments by ranges has been as follows, for two years past:

| Range. | 1906 Tons. | 1906 Per Ct. | 1907 Tons. | 1907 Per Ct. |
|---|---|---|---|---|
| Marquette | 4,057,187 | 10.5 | 3,991,479 | 9.6 |
| Menominee | 5,109,086 | 13.4 | 5,130,167 | 12.3 |
| Gogebic | 3,641,985 | 9.5 | 3,555,672 | 8.5 |
| Vermillion | 1,792,355 | 4.6 | 1,684,891 | 4.1 |
| Mesabi | 23,792,882 | 62.0 | 27,455,116 | 65.5 |
| Total | 38,393,495 | 100.0 | 41,817,325 | 100.0 |

The changes in 1907 were decreases of 65,708 tons on the Marquette, 86,313 on the Gogebic, and 107,464 on the Vermillion; increases of 21,081 tons on the Menominee and 3,662,234 on the Mesabi; the total gain being 2,423,830 tons, or 6.3 per cent. The increase on the Mesabi was greater than the entire gain.

Accurate records have been kept of the iron-ore shipments from the Lake Superior ranges from the beginning. The following table gives the year in which shipments began on each range, and the total tonnage up to the end of 1907:

| Range. | Year Opened. | Total Shipments. Tons. | Per Ct. |
|---|---|---|---|
| Marquette | 1855 | 84,849,280 | 22.3 |
| Menominee | 1877 | 63,806,652 | 16 8 |
| Gogebic | 1884 | 54,023,478 | 14.2 |
| Vermillion | 1884 | 26,785,950 | 7.1 |
| Mesabi | 1892 | 150,198,054 | 39.6 |
| Total | .... | 379,663,414 | 100.0 |

In 15 years the Mesabi shipped almost twice as much as the Marquette did in 52 years.

### Details of Production.

The Steel Corporation shipments were:

| Range: | 1906. | 1907. | Changes. |
|---|---|---|---|
| Mesabi | 14,137,645 | 16,331,056 | I. 2,193,411 |
| Vermillion | 1,792,355 | 1,685,327 | D. 107,028 |
| Gogebic | 1,511,854 | 1,512,416 | I. 561 |
| Menominee | 1,536,275 | 1,606,850 | I. 70,575 |
| Marquette | 1,375,119 | 1,224,686 | D. 150,431 |
| Total | 20,353,248 | 22,360,334 | I. 2,007,086 |

The Mesabi range had in 1907 no less than 12 mines which shipped over a million tons each. These were the Hull-Rust, 2,900,684 tons; Morris, 2,076,521; Mountain Iron, 1,973,265; Fayal, 1,878,895; Mahoning, 1,563,000; Burt-Pool, 1,501,287; Stevenson, 1,150,000; Adams, 1,136,567. The big shipper on the Vermillion was the Pioneer, with 830,733 tons. On the Old Ranges larger shippers were the Chapin, on the Menominee, 851,468; the Norrie, on the Gogebic, 732,679; the Lake Superior, on the Marquette, 549,751 tons.

*Mining engineer, Duluth, Minn.

### Labor Situation.

The labor situation of the year was serious. Attempts of the Western Federation of Miners to organize the region, more particularly the Mesabi, culminated in June in a great strike. This complicated and followed a strike of ore-dock men at Duluth and adjacent ports. The conditions that presented themselves were met by the mine owners so successfully that more work was done in the home of the Federation than had ever been done there before. The strike was broken and the Federation left with no strength and no standing. It was fortunate for all concerned that a concern big enough to handle the matter and with capital and an organization fully equal to any emergency was on hand to take the burden. The Oliver Iron Mining Company told others to stand back and it would handle the struggle, which it did with remarkable success.

No doubt the Western Federation will make further attempts to carry its organization into the Lake Superior region, but it will never succeed. On every range business men and citizens generally stood squarely back of the mining company and assisted in winning the fight, and will assist every time aid is needed.

### Mines and Railroads.

In various past years the shipments of various individual mines aside from the Mesabi range ran into the seven-figure class. But a change has come. Of the nine mines of the million-ton class this year, all are on the Mesabi. All but two are Oliver Iron Mining Company properties. One of the Oliver mines produced the enormous total of 2,900,000 tons, and several were about 2,000,000 tons. Such figures have been unknown heretofore.

Railroads that have handled such tonnages deserve their share of the credit for the year's operations. It is no small thing to move from mines to ships, in one month, 2,250,000 tons, all one-way freight. The Duluth, Missabe & Northern road did this.

The tonnages of iron ore carried by the various railroads serving the mines were as follows:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Duluth, Missabe & Northern | 11,230,218 | 13,445,979 | I. 2,215,761 |
| Duluth & Iron Range | 8,205,126 | 8,188,905 | D. 16,221 |
| Great Northern | 6,133,057 | 7,505,125 | I. 1,372,068 |
| Chicago & N.W. | 6,706,986 | 6,971,111 | I. 264,125 |
| Lake Superior & Ishpeming | 1,889,631 | 1,916,168 | I. 26,537 |
| Chi., Mil. & St. Paul | 1,931,244 | 1,585,961 | D. 345,283 |
| Duluth, S. Shore & Atlantic | 1,074,945 | 1,323,346 | I. 248,401 |
| Wisconsin Cent. | 693,892 | 878,730 | I. 184,838 |
| Total | 37,865,099 | 41,815,325 | I. 3,950,226 |

Four of these roads are exclusively ore carriers, their other business being limited to mine supplies and the necessities of the mining region.

The roads have few plans for betterments for the new year; their present equipment is sufficient for the business, generally speaking. But the Duluth & Iron Range is adding a steel ore-shipping pier at a cost of $1,100,000, and the Duluth, Missabe & Northern road is constructing a coal-receiving dock that will have a greater storage capacity than any such dock on the Lakes, and is built of concrete and steel. Both these lines will add somewhat to rolling stock. None of the other five railway systems engaged largely in handling ore from mines to the Lakes will make any material changes in equipment for the new year.

### The Western Mesabi.

The new west Mesabi field is of vast extent. While thousands of drill holes have been put through ore it has not yet been completely explored. But enough has been proved to give assurance that, with operations on the scale planned, there is ore to last many decades. At its Canisteo property, in sections 30 and 31 55-24, the Oliver company is digging a mining pit that will be more than 200 acres in extent. The overburden there is of an average thickness of 85 ft. A total of nearly 30,000,000 cubic yards of material will be moved from this mine alone. Three miles northeast is the Holman deposit, itself a vast iron body. Still further east is the Arcturus, of many million tons, while various intermediate deposits are known through the towns of 56-23, 56-24 and 55-25. Open-cut mining will be the method generally followed in this part of the region, even though the overburden is heavier than has been removed elsewhere. For the most part the surface is of clay and fine sand intercalated with an occasional layer of gravel, or jasper, or jasper boulder, and it presents no unusual obstacle to removal by the steam shovel. As the ore lies in the deposits it is not on the average above 40 per cent. metallic iron, some will run under 35, and all will carry

a heavy excess of silica. As it comes from the concentrator it is brought up to an ore at least 20 per cent. better in iron, frequently under bessemer limit, and with 80 per cent. of the silica removed. It has also become coarse grained and granular, of open and free texture, excellently adapted for the furnace.

### New Explorations on the Mesabi.

For the first year since the discovery of the Mesabi range it is a question if the new ore developed there has kept pace with that taken out. Few new deposits have been found. Most of the work of exploration was confined to the edges and bays close to old ore finds, and in many cases this closer exploration has limited the confining lines of known orebodies as much in one place as it has increased them in another. In the Embarras Lake district, east Mesabi, some ore has been found and some holes have shown a remarkable depth of high-grade iron. Some of these holes have gone more than 200 ft. in good ore, and the tonnage found there amounts to several million tons. On the west end of the range several good deposits of merchantable ore have been found, notably about 5,000,000 tons in section 9-56-23 close to the quartzite. West of the Mississippi river ore has been found, but it is low grade and in somewhat inaccessible locations. The Oliver Iron Mining Company has maintained drill operations with a large force all year, but its work has been more in the nature of determining the limits of known orebodies and preparing cross-sections for mine operations than in discovering new deposits. In this work it is found that close examination of the boundaries of deposits adds very little to the tonnage, a swelling at one place being offset by a shrinkage at another. It seems evident that in the future additional Mesabi tonnages will be slight and will come from the more precise delimitation of known deposits, rather than from discoveries of new lenses. The range has been punched too full of holes to permit any large iron orebody to remain hidden till now. Some mining companies have found it advisable to include in shipments high-grade jasper and the tonnage of a few has been improved by this. Some 25 new shippers are on the Mesabi lists this year, all deposits heretofore known.

### The Vermillion Range.

On the Vermillion little new ore was found, and the work of exploration in progress a year ago has ceased. The most favorable of these—that on section 30-63-11—has not been successful as hoped for, and has stopped. But it will take a lot of drilling to condemn section 30, and the end is not yet. It is improbable that, where there is such a long continued series of iron-bearing formation as is shown on the Vermillion range, with conditions in so many places favorable for the deposition of ore, there should be merchantable deposits at only two locations, those of Soudan and Ely; but the fact remains that since the discovery of the Ely trough in 1888 no mines have been found on that range, and millions of dollars have been spent in the search.

### The Cuyuna District.

The new Cuyuna district, west of Duluth, is still a puzzle. There is no question that one mine has been found the past year, and so far it is the net result of drillings extended over a period of five years. It, indeed, is on lands that had been drilled twice before. The firm of Rogers, Brown & Co. was so well assured of a mine that they paid large sums in advance royalties and are now sinking operating shafts and arranging for shipments. Lands near have shown lean ores more than 800 ft. deep, with a vast tonnage, but at present useless on account of their low grade. Explorations on that range are as active as ever and it is hoped that by the close of another year some accurate and definite information will be available. But this must come from shafts and drills and crosscuts, as it is impossible to tell very much of a vertical formation by vertical drillholes. The region will be difficult to mine, as it is overlaid by sands and the ground is very wet, caving will be difficult and pumping costs will be heavy.

### The Menominee Range.

There has been much activity on the Menominee range. This is a wide and strong and persistent formation well worth exploration, and a number of companies are finding good deposits there, most of which were mentioned last year. A number of new explorations in the vicinity of Stambaugh, Iron River, and Crystal Falls may prove mines before another winter. In the Iron River section the new shippers of the year were the Baker, of Corrigan, McKinney & Co.; the Mineral Mining Company's James mine; the Chatham of Oglebay, Norton & Co., the Hiawatha of the Buffalo & Susquehanna; the Fogarty of Pickands, Mather & Co., and the Youngs of the Exploration company of that name. Several new shafts are being sunk, notably at the Berkshire and Groveland. Almost every piece of land on the iron bearing formation in the district was optioned and ready takers are found for all developments. In the Crystal Falls section, where Corrigan, McKinney & Co. are heaviest operators, that firm kept up its pace in new developments, the Kimball being their most interesting new property. The Oliver Iron Mining Company is developing the Michigan and Mastodon, both old properties. At the Loretto, which is bounded on three sides by the Sturgeon river and tributaries, an important work was undertaken, no less than the building of a new river channel for a considerable distance, in order that the mine may be extended under its old bed and to the old Appleton property, on the other side, where ore has been found.

### The Marquette Range.

The chief development of the year on the Marquette range was the opening of the Maas mine, on which the Cleveland Cliffs Iron Company has been working for the past five years. Hoisting through a vertical shaft of large dimensions, which is now 1,140 ft. deep, was commenced the past summer. It is elaborately equipped and has the distinction of being the most costly operation, to the time of producing ore, that was ever inaugurated in the Lake Superior iron region.

The Stephenson, Smith and Austin mines are a new development of the Cleveland Cliffs Company in the Cascade district, and there this company is constructing a model town, on lines slightly similar to those along which the Oliver company is laying out the town of Coleraine. These mines will become an important center of ore production, and this section may be said to be the result of the past two years. A new center of ore production is no slight matter, and this is one of the very important developments of the year. The ore is a soft hematite, running close to 60 per cent., that of the Austin higher than that, and bessemer. The mines are not deep, are well equipped, well arranged and safe, and are conducted along the best lines.

### The Gogebic Range.

There have been a number of footwall steel shaft and fireproof shafthouse erections along the Gogebic. In other words the future of that district was never so well assured for long and profitable continuance as today. Deep work under cross-dikes at the Newport, some time ago, gave the utmost confidence, and this was increased by later developments. It is regarded as a safe proposition to go 2500 to 3000 ft. is search of ore. Deep drilling is practically impossible, and the only way to determine the facts is by sinking and crosscutting. This is under way at many places. In the earlier days most Gogebic range work was from the hanging wall, and could be regarded as merely temporary. Of the five deep shafts recently sunk there, which have either steel headframes or are steel lined throughout, all but one are on the footwall side of the formation. All of the 10 all-steel shafts now sinking are in the same side. These are all planned to go to at least 2000 ft., and some will doubtless continue steadily to 3000 ft. Substantial orebodies have been recently found at several mines after sinking through a considerable distance of barren ground, this being especially true at the Newport and Montreal, the former at the depth of 2400 ft. A list of the mines

where improvements of the nature referred to above are will include practically all the large producers of the district. The new shaft at the Geneva will probably go to 3000 ft.; it is now down more than 2000. So far no attempt has been made to crosscut to the formation in search of ore. At all Gogebic mines deeper sinking is the order of the day, and the range is undergoing a transformation that is remarkable. But while the Gogebic is extending its limits in one direction, it does not seem able to do so in others. Explorations the past year in the country west of Tyler's forks were a repetition of those before, and nothing of value was found. Indications are there in plenty, but the district seems to be a region of interbanded magnetite schists of poor prospects.

### The Baraboo Range.

In the Baraboo district, south of the lakes, the year saw little change. There is a narrow deposit extending a considerable distance and to some depth, and the average annual product is 50,000 tons. This is coming from the mine of the International Harvester Company, other people finding the district unfavorable.

### The Canadian Ranges.

On the Canadian side of the lake the Oliver Iron Mining Company has been working near Steep Rock lake, west of Lake Superior, and has developed one fair mine and some prospects. This is near the Atikokan deposit which is now being mined for the 100-ton furnace that was blown in at Port Arthur last June. This ore is a high-grade magnetite, carrying enough sulphur to require roasting, and is in large quantity. The great deposits reported to exist east of and near Port Arthur, where 200,000,000 tons were said to be proven, have not yet been opened. As they consist merely of thin bands of red ore sufficient in quantity to stain a large mass of material, they are not likely to come in for some time. The explorations that were maintained in the far north, east of Nepigon lake, have been discontinued and are succeeded by others still more distant, on the shores of Hudson bay, where distances are so vast and climatic conditions so severe that ore must command an abnormal price to permit exploitation. There remains only the Moose Mountain region, where preparations for the shipment of considerable tonnages of high-grade ore are well along. This district is close to Georgian bay and will be connected with it by rail this year. It will be an important mining center, and will provide ore for steel works planned for Toronto and other Canadian cities. If conditions are right it may mean some export ore, for it should be laid down on Lake Erie at low costs. Mining will be cheap, and both rail and lake freights will be less than from average Lake Superior districts. Doubtless a tremendous mass of ore exists there.

### Company Shipments.

Of individual operations of the year the Oliver Iron Mining Company had its customary lead, with a production of 22,553,000 tons, out of an estimated total of 42,000,000 tons, lake and rail. This is about the Corporation's average for its preceding years, being 53.7 per cent. of the whole. Of the company's total, 15,000,000 tons came from the Mesabi range, and of this amount one-third was mined underground and the rest by steam shovel and milling. This company moved from one mine, its Hull-Rust at Hibbing, a total of 2,000,000 tons during the season of navigation, though it was impeded by the strike in the hight of the season. This Hull-Rust had been under development three years and produced in that time 4,600,000 tons from its open pit. During portions of this period as high as nine steam shovels worked side by side in the pit, moving earth and ore. A year ago in October the Oliver company began stripping the Virginia group on a comprehensive plan, and this year it has mined therefrom 1,000,000 tons. This company, in 1907, removed more than 20,000,000 yards of overburden and its total tonnage handled by steam shovel on the Mesabi range during the period was no less than 27,000,000 yards.

### Improved Mine Equipment.

The process of standardizing and remodeling lake iron-mine power plants and equipments on the latest and most efficient designs proceeded during the year. It was aided by the strength of mining companies and their willingness to make expenditures that a few years ago would have been impossible. This march of improvement was led by the Oliver company, which stopped at no reasonable improvements, whatever its expense, providing it could be made to show a lower ultimate cost in producing the ton of iron. The question by which all proposed betterments has been weighed has come to be, for all Lake mining companies: "How much will it reduce the cost of raising ore?" Hoisting equipment, shafthouses, shafts themselves, underground and overhead haulage, stripping devices, everything, has been standardized. Mesabi mines now use standard-gage locomotives and all-steel self-dumping stripping cars for their removal of overburden. There is no more of the dinkey engine and the little one-ton stripping car. Tracks in mines are heavily and permanently built. Shafts are steel-lined, and are placed in solid ground, well away from the workings, connected therewith by crosscuts of sufficient length to keep them from danger of caving.

### Mining and Stripping Costs.

There was little change in the expense of mining ore. Stripping costs vary now from 23 or 24c. up to 60c., the higher figures on account of winter and shallow work, long hauls for the waste, jobs of little yardage, bad weather or other untoward conditions. A steam shovel will handle in 10 hours, week by week, 2000 to 2500 yards. While this is far below records one reads of, these are too frequently made after days of preparation in which little is accomplished, so that the average of the steady, slow and persistent operator shows far better than that of the record breaker. The average cost of mining ore under ground and placing it on stockpile is not far from $1 per ton.

For years the ideas of mine operators as to the depth permissible in stripping overburden have been undergoing change and revision. To-day the Oliver company is of opinion that it will pay to strip if the final cost of winning ore is as great as if mined underground. This because of the fact that the open pit gives a chance for big tonnages to be got immediately when needed, does away with a large amount of unskilled labor, cuts out timbering and the dangers incident to underground work, and has other advantages. This idea, carried out, will permit stripping to far greater depths than at present, and to-day mine operators are taking off a thickness of 100 ft. It will also permit a greater development of the stripping plan in small and thin deposits, and the rule of 2 ft. of surface to 1 ft. of ore, radical as that appeared two or three years ago, must give way to the 3 or 4 ft. to one.

### Prospects for 1908.

Indications for 1908 are not especially brilliant. The enormous shipments of the past summer and fall have not been taken to furnaces, and there is little probability they will be consumed this winter. In that event there will be accumulations of ore at lower lake ports and in furnace yards in the spring, greater than have been known in the past. This fact will give no incentive to exceeding the tonnages of 1907. Doubtless there will be a lower price for ore, an additional reason for remaining quiet. Labor troubles are likely on the lakes, among the vessel interests, and the fleet will start out late. Careful and well posted mining men estimate that there will be a decline in shipments for 1908 of from 25 to 33 per cent. from those of 1907. This will bring the estimates for the new year to about 30,000,000 tons. I doubt if the reduction is so great, but there cannot be reasons for anticipating shipments of more than 33,000,000 tons in 1908.

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According to the *Brass World* plaster of paris, when melted, fuses to a clear liquid which has the property of dissolving metallic oxides. This property is made use of in brass foundries to remove iron from melted brass.

# The Diamondville Coalfield, Wyoming

## At Practically All the Mines, Rooms Are Driven to the Rise and Cars Reach the Face by Self-acting Planes

BY A. T. SHURICK*

For a field having such a high-grade coal, and with so bright a future, the Diamondville district is remarkably destitute of technical literature. The calorific value of the Diamond coals is higher than the Rock Springs, which are popularly considered the best in the Northwest, the former running as high as 7560 cal., while the latter has a maximum of 7358 calories.

### Geography and Geology

The Diamondville district is located on the Oregon Short Line Railroad (a portion of the Union Pacific Railway), in practically the extreme southwestern corner of the State. It is 270 miles by rail northeast of Salt lake, and 440 miles south of Butte, to which latter point much of the coal goes to supply the mines and smelters.

Geologically, the field is one of considerable interest, as none of the eight large mines of the district has failed to encounter, and incidentally be cut off to a greater or less extent, by faults usually in the shape of "wants." These are generally intrusive clay bands which gradually increase in thickness seeming to displace the coal and eventually becoming so large as to make economical mining impracticable.

The two seams producing practically the entire output of the district, described by the United States Geological Survey as the Kemmerer and Willow Creek, belong to the Fort Benton division of the Colorado formation and, in common with most of the Western coals, of the Upper Cretaceous period. The general course of the outcrop is N. 15 deg. E. and the seams have a strong western dip varying from 15 to 35 deg. The Willow Creek seam lies to the east of the Kemmerer, and stratigraphically 550 ft. below it.

The anticlinal axis, which determines the extreme eastern limits of the field, is two and a half miles east of the outcrop of the Kemmerer seam at the south end, and six miles at the north end. It is probable when these older measures, which belong to the Bear River and Jurassic, have been more thoroughly prospected that a still higher grade of coal will be found.

To the west, through the remainder of the Fort Benton and into the upper Montana, in all about 7000 ft., stratigraphically, no coal has been found, but from here on almost innumerable beds of lignite of most extraordinary thickness are found, until the Absaroka fault is reached, which determines the western limit of the field. This fault is a displacement of over 15,000 ft., and at the south end is about seven miles west of the Kemmerer seam outcrop, while at the north end it is about two miles west; from its general course as far as it has been traced, it should cut the Kemmerer and Willow Creek seams off in T. 24 N., but as the coal has been found and well prospected in T. 25 N. the fault must change its direction. Three of the lignite seams, mentioned above, are 84, 35 and 22 ft. thick respectively (the 84-ft. seam having but one parting consisting of clay 2 in. thick), but are unfortunately of very inferior grade. One of the smaller seams of a somewhat higher grade is now being developed, and the success of the operation will be watched with considerable interest, as there are large tracts of Government land having this coal still available for entry.

### Historical

These coals were first discovered by Fremont in the fall of 1843 and were again reported by Clayton and Stansbury in 1848 and 1852, respectively, but it was not until 1894 that the first important development work was started, the pioneer mine of the district being the Diamond Coal and Coke Company's mine No. 1 at Diamondville. The excellence of the coal was soon proved and in 1895 the Kemmerer Coal Company opened mines at Frontier, two miles north of Diamondville. This was followed by the building of about 20 miles of railroad tapping the field to the south, and in 1900 the Diamond Coal and Coke Company opened its mine No. 4 on this branch and the Union Pacific Coal Company started the development of its Cumberland mines.

### The Mines

The Diamond Coal and Coke Company is now operating three mines and producing about 2000 tons daily, nearly all of which is shipped to Butte and Anaconda. They have towns at each mine, all built on the average mining-camp principle, equipped with electric lights and water works. Glencoe, at No. 4 mine, is somewhat above the average, its houses being built of brick made from a passable clay found nearby.

The Kemmerer Coal Company is perhaps following the most aggressive policy of any company in the field and promises in time to become the predominating figure in the district. They are operating two mines at Frontier, about two miles north of Diamondville, and producing about 1600 tons, all of which goes to supply the commercial market, principally in the Northwest. They practically control the district from Diamondville as far north as the field has been prospected, and are now opening two new mines on the Kemmerer seam about six miles north of Frontier. They also have excellent showings on this seam in township 24 and 25 north and will doubtless start developing these as soon as the railroad reaches them.

The Union Pacific Coal Company operates three mines at Cumberland, producing about 2200 tons, all of which goes to coal the railroad west to the coast. They have two quite substantial towns, electric lighted and with water works. They control the land from Cumberland south, but the prospects here have not shown up favorably, and as their mines have encountered several of the pinches so characteristic of the district, the life of the camp is probably limited to a few years.

### Systems of Mining

The Diamond mine No. 1, at Diamondville, being the oldest, and probably facing the most serious problems, is selected for description.

Slope mining is, of course, the ideal system for a field of this character, the slopes being driven with return air-ways on both sides, and water-level entries turned every 350 to 375 ft. A solid pillar 100 ft. thick is left between the return air-course and the first room. The rooms in the early days were driven quartering the pitch, and the cars hauled up to the face, but the latest practice is to drive the rooms in pairs, straight on the raise, the descending load in one room raising the empty in its neighbor. This system has been found highly satisfactory, and is recommended as a great saving in live stock. Rooms are driven generally on 60-ft. centers, with a 35-ft. room and 25-ft. pillar, and barrier pillars of from two to three rooms being left in at intervals, depending on the roof conditions. The rooms are first driven up in the bottom coal consisting of about 7 ft., and the top coal about 5 ft. is brought back.

Owing to the thickness of the seam a unique system of making the entry turnouts is made practicable which is deserving of some attention. The turnout is

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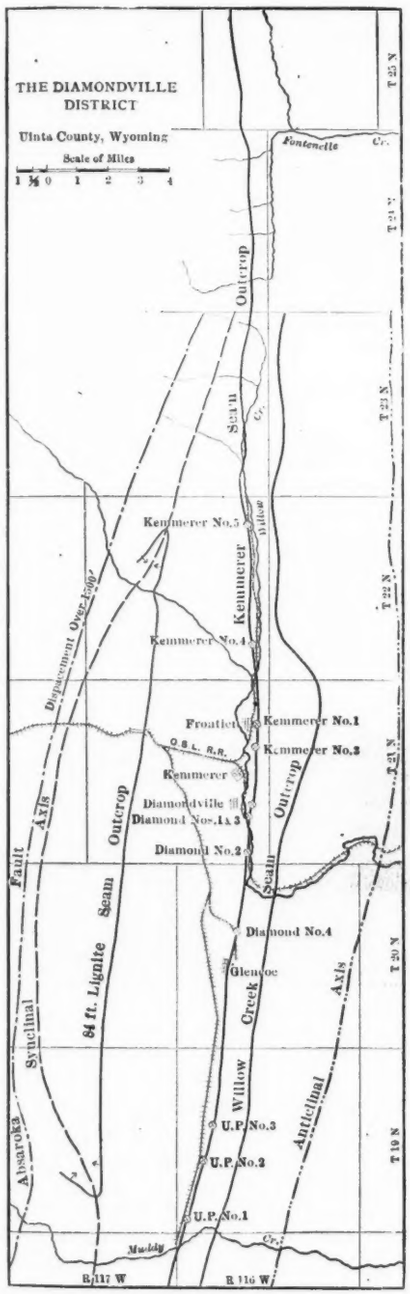
first driven in the coal to within 2 ft. of the manway, and the roof is then shot down until sufficient hight has been gained for the turnout to cross over the manway, leaving about 4 ft. of solid rock between the two. At first glance the cost of this would seem to make it prohibitive, but as very little rock has to be loaded




SKETCH SHOWING LOCATION OF MINES AND OUTCROP OF SEAMS

out and the advantage is secured of having the broad double parting in solid rock, hence doing away with considerable expensive timbering. The absolute safety at so important an air split, with such a strong natural overcast is no small item itself in times of fires or explosions.

Horses are used exclusively for haulage on the water-level entries to the slope where twelve car trips of about two tons to the car are made up and hoisted to the surface with a 28x60-in. Corliss first-motion E. P. Allis engine. One and a half-inch steel rope is used and the slope track is laid with 60-lb. railroad iron, surfaced and kept up in a shape that might be the envy of some railroads. This has been found economy, as it permits of almost unlimited speed in hoisting with a minimum number of wrecks.

The surface topography admitted of but one location for this mine and to avoid passing under Ham's Fork creek with too light cover, it was necessary to sink the slope about 30 deg. to the north off the true dip. The Ham's Fork also prevented the first five south entries from being turned. A uniform increase in two bands of clay from 1½ in. and 1 in. at the fourth north entry, to 1 ft. 3 in. and 2 ft. 4 in. respectively at the tenth north entry, precluded any possibility of sinking farther in this direction. A careful study of the line of increase of the bands as determined by the north entries was then made and the slope turned accordingly at a little below the eighth south entry and sunk in good coal as far as the thirteenth south entry, when the fault took another swing to the south and the mine was finished with regards to any further development at the fifteenth south entry. The mine is purely a pillar-coal proposition now and it is expected to last eight years.

## Pumping

Drainage is accomplished by a series of small compressed-air and steam pumps throwing the water to a large sump at the eighth south entry, whence it is delivered to the surface through a 6-in. water line by a 16x28x7x24-in. compound plunger station pump working under a head of 480 ft., capable of handling about 400 gal. per minute. Serious increases in the water have been noticed during the past year, in one case even getting beyond the capacity of the pumps, and an electric pumping plant is now being installed. This consists of a 20x48-in. E. P. Allis engine, driving a three-phrase 180-kw. generator. The pump will be a multi-stage centrifugal designed for 500 gal. per minute. The plant is being so laid out that its capacity may readily be doubled, as is thought will be necessary before the mine is finished.

The laborers consist principally of Americans, Finns and Italians. Wages inside run from $3.10 for unskilled labor to $4 for skilled, and outside from $2.50 to $4, all working eight hours. Miners are paid 52c. per short ton.

## Ventilation

The mine is ventilated by a 24-ft. exhaust fan of the Guibal type furnishing 141,000 cu.ft.

The slope is the main intake and the air is split at each entry, entering the main or top entry, traveling to the face through all working rooms and returning in the back entry to the manway which is also the main return. The system is ideal, furnishing each entry its own supply of air direct from the main intake, and also tending to localize any explosion. The mine occasionally shows small quantities of fire damp which burns in a peculiarly sluggish manner when ignited.

The surface plant, as usual in old mines, has developed into quite an item. The power plant consists of thirteen return tubular boilers averaging about 72 in.x16 ft., and developing 1600 h.p. A 24x24¼ x30-in. straight-line Ingersoll-Sergeant air compressor furnishes power for a portion of the mine pumps, the remainder being run by steam. There is a blacksmith shop equipped with a heavy steam hammer, and a machine shop having an 8-ft. planer, a lathe on a 12-ft. bed having a 24-in. swing and a 26-in. drill, all run by a small 10x16-in. engine. Attached to the machine shop is a sawmill in miniature used to saw the mine timbers to the required length. The tipple is equipped with a Wilson cross over dump and shaking screens.

## The Coal

As has already been stated, the quality of the coal is exceptional, comparatively speaking, of course, as regards Western coals. A typical section of the Kemmerer seam is:

| | |
|---|---|
| Coal | 1 ft. 3 in. |
| White Rock | 0 1 |
| Coal | 4 4 |
| Bone | 0 ½ |
| Coal | 2 3 |
| Bone | 0 2 |
| Coal | 4 3 |
| **Total** | **12 ft. 4½ in.** |
| **Total Coal** | **12 ft. 1 in.** |
| **Total Impurities** | **0 ft. 3½ in.** |

One regretable feature is that the two bands of bone are "frozen" to the coal, but they are so small as compared with the seam that it is not a serious fault.

A typical analysis of the coal is:

| | |
|---|---|
| **Loss of moisture on air drying** | **1.30** |
| **Proximate:** | |
| Moisture | 5.13 |
| Volatile matter | 40.51 |
| Fixed carbon | 49.75 |
| Ash | 4.61 |
| **Ultimate:** | |
| Sulphur | 0.49 |
| Hydrogen | 5.63 |
| Carbon | 72.95 |
| Nitrogen | 1.18 |
| Oxygen | 15.14 |
| **Calorific value determined:** | |
| Calories | 7,202 |
| B.t.u | 12,964 |
| **Calorific value calculated from ultimate analyses:** | |
| Calories | 7,194 |
| B.t.u | 12,949 |
| **Pounds of water at 212 F. evaporated by one pound of coal (calculated from calorific value)** | **13.69** |

According to the carbon hydrogen ratio classification of coals, the Willow creek seam is in group G, which includes the Upper Freeport and Pittsburg coals of West Virginia and the high-grade coals of Kentucky and Alabama, while the Kemmerer seam falls in the next lowest, Group H, including the Indian Territory and Kansas coals, the high-grade coals of

Illinois, Iowa and Missouri and the second-grade Kentucky coals.

The coal is described by the United States Geological Survey as an "excellent fuel for all purposes, quite hard, breaks with a bright fracture, and stands storage and long transportation with but little loss," which is a concise and conservative description.

That the Kemmerer seam, at least, is an absolute failure as a coking proposition has been proved by the shipment of a carload of the Diamond coal to retort ovens in Pennsylvania where the coke experts declared it a freak and a failure.

## The Coal Mines of Southern Wyoming

By Floyd W. Parsons

Every county in the State of Wyoming, with the exception of Laramie, has an abundance of coal lands. The combined coal area of the entire State is estimated to be more than 30,000 square miles. Much of this territory is at present unavailable, and a considerable portion will probably prove to be of small commercial value; however, many parts of the State have not been carefully exploited, and the future will undoubtedly show large coal areas at present unknown.

One disappointing feature regarding the coal industry in Wyoming is the failure to find a high-grade coking coal. The same coal measures which extend into Colorado, contain large tracts of first-class coking coal, and the large quantities of iron ore which remain to be smelted, make the discovery of a coking coal most desirable.

The coal lands of Wyoming, like those of other Western States, have been opened to entry; it is necessary for the applicant to be a citizen of the United States, or to have declared his intention to become such. Before the action of President Roosevelt in withdrawing coal lands for the purpose of preventing large companies and unscrupulous speculators from gaining control of the most desirable tracts, the quantity of lands allowed one individual was 160 acres, for which the Government receiver had to be paid not less than $10 per acre in case the lands were situated more than 15 miles from any completed railroad, and not less than $20 per acre for all lands located within 15 miles of a railroad.

### Coal Seams of Wyoming

The principal coal beds of Wyoming are broken by a number of small faults which greatly increases the difficulties of mining. In many parts of the State the coal seams have burned away at the outcrop, which has permitted the overlying sandstone stratum to sink down into the area formerly occupied by the coal.

The thickest seam so far discovered in Wyoming, is located four miles west of Kemmerer, at Adaville. This bed occurs in the higher Laramie rocks and shows about 80 ft. of pure clean coal. The seam is a fair grade of lignite, and has never produced fuel for the market. Careful prospecting has shown that the formation here present contains at least 12 workable lignite seams, varying in thickness from 5 to 80 feet.

### The Kemmerer Coal Company

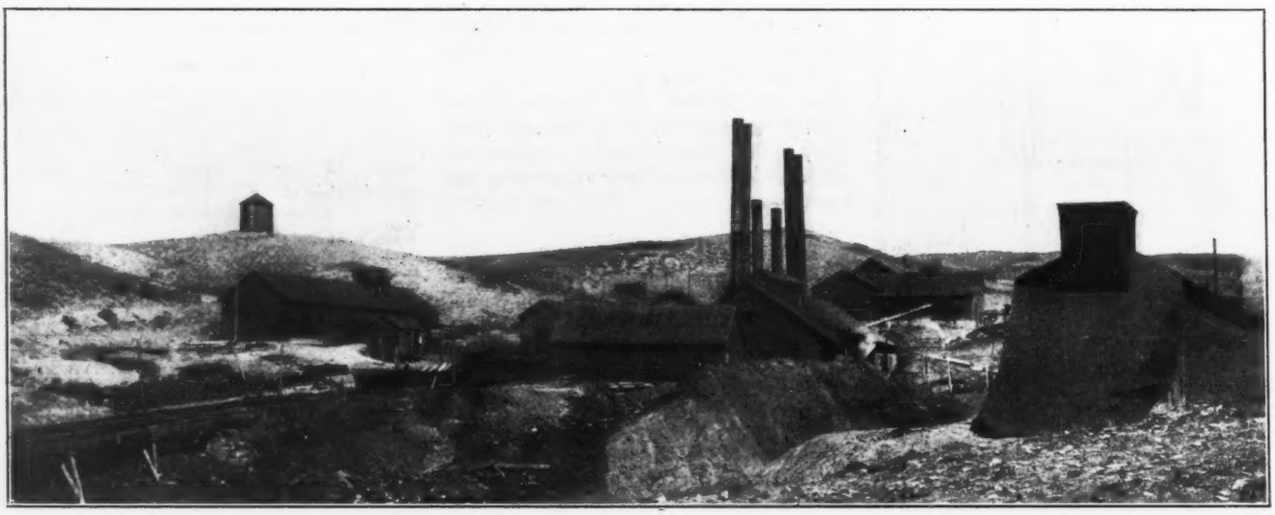
The No. 1 mine of the Kemmerer Coal Company at Frontier on the main line of the Oregon Short Line Railroad, produces 1200 tons per day; the No. 3 plant has an output at present of 400 tons daily. The markets for the Kemmerer coal are in Nebraska, Kansas, Wyoming, Utah, Nevada, Montana, Washington, Oregon and California. During the past fall almost the entire output was shipped west, although normally about one-third of the Kemmerer production goes east.

Both the No. 1 and No. 3 Kemmerer mines are ventilated by a Guibal fan, operated by steam and working as an exhaust. Overcasts and undercasts are used in the system of ventilation. Slight traces of gas are present, but no serious trouble from this cause has been experienced.

The general method of operation as carried on by the Kemmerer Coal Company is to work everything on the room-and-pillar system. The main entries are generally 12 ft., while cross-entries are driven 10 ft. wide; rooms are started with a 12x18-ft. neck and are worked 28 ft. wide. Room centers vary from 55 to 60 ft. apart. Each pair of cross entries are driven about 300 ft. apart, and a 20-ft. pillar is left between the face of each room and the back entry ahead. The mine is entered by a slope which goes to the dip, while cross entries are driven to the strike and rooms off cross entries go to the rise.

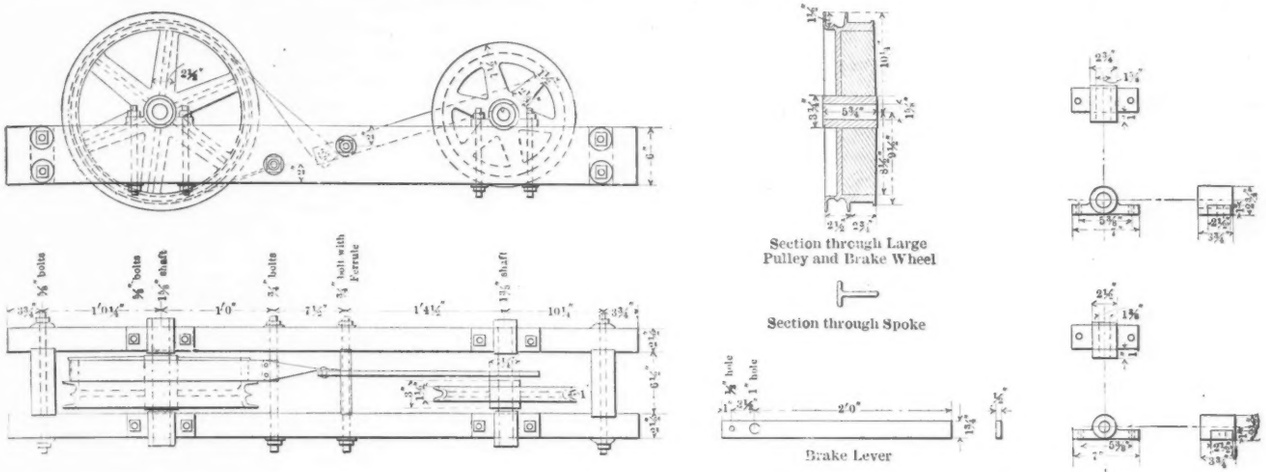
### The McGinty System for Handling Cars

A rather unique plan for getting the cars to the face of each room has been adopted by the Kemmerer company. The detailed arrangement of the pulleys or sheaves, over which the rope system operates, is shown in the accompanying illustration. The plan is most flexible and can be changed to suit different conditions. As here employed, the scheme is to have the empty car in one room pulled up to the face by the loaded car in an adjacent room. Two rooms are either driven parallel and at the same time, or one room is driven wide, and two tracks are laid in it. The sheave arrangement shown in the diagram can be securely fastened to the props in a cross-cut or a room, and as soon as the pair of rooms has been worked to the limit, the sheaves can be moved to the next room. The speed of the cars can be regulated by the hand-brake operating on the large pulley wheel.

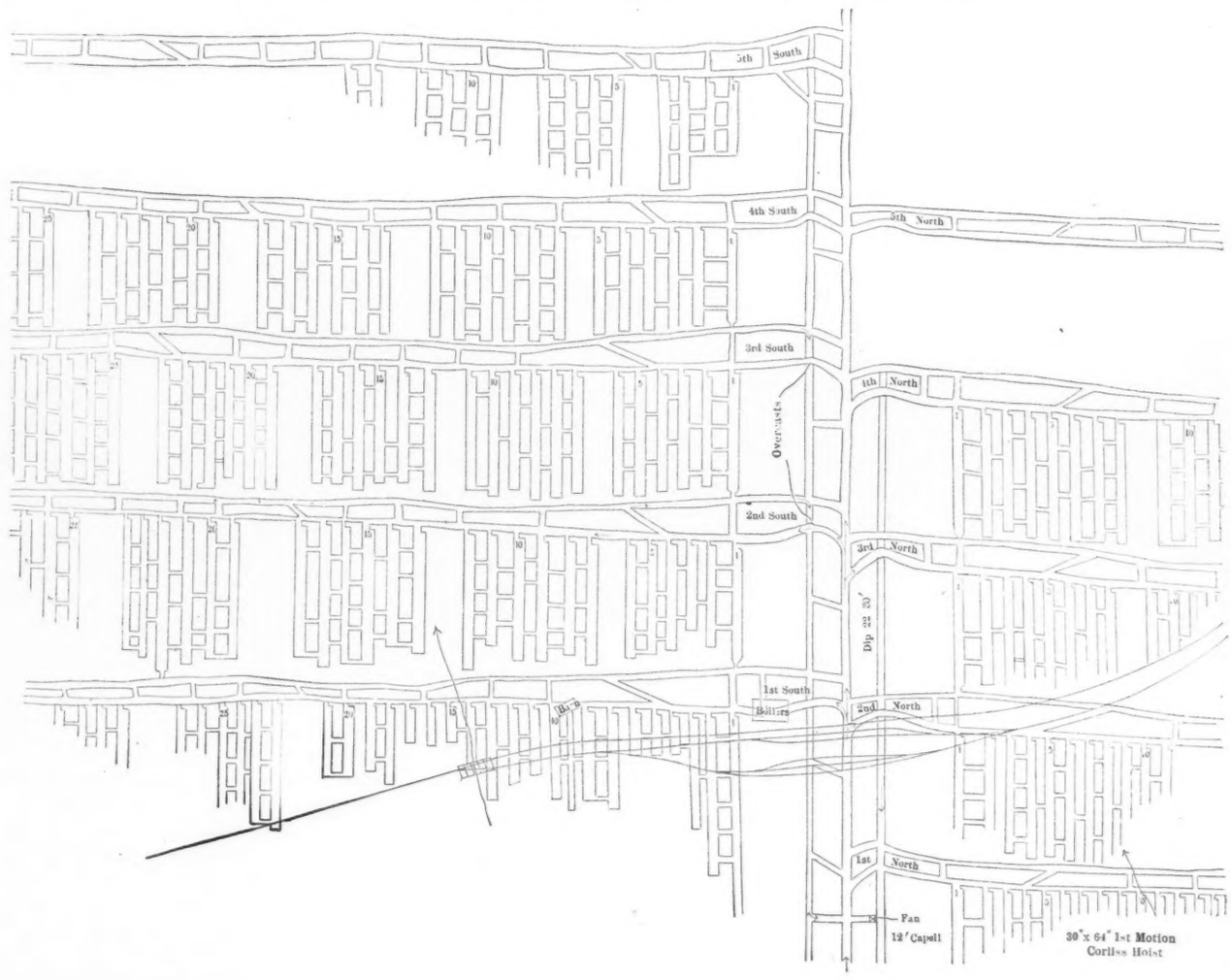


GENERAL VIEW FRONTIER COAL MINE, KEMMERER COAL COMPANY UNITA COUNTY, WYOMING

Electric current and compressed air are not used to any considerable extent; the boilers at the No. 1 Frontier mine furnish power for the fans, electric plant and




ARRANGEMENT OF PULLEYS FOR McGINTY SYSTEM OF HANDLING CARS IN ROOMS




MINE NO. 4, DIAMOND COAL AND COKE COMPANY, DIAMONDVILLE, WYOMING

main haulage system on the slope. No mining machines or pick mining is employed, and all coal is shot from the solid. Neither entries nor rooms are driven on sights. The entire equipment of the mines in southern Wyoming is simple and in no way fancy or expensive. The oldest coal mine of the Amalgamated Copper Company, located at Diamondville, Wyoming, is shown in the insert which accompanies this number of the JOURNAL.

### LABOR AND TRANSPORTATION

The Kemmerer mines, like all other coal companies in southern Wyoming, employ union labor exclusively. The scarcity of miners that prevailed during the early part of 1907 has been remedied and the supply of laborers is now more than adequate. The company employs about 675 men, and the town of Frontier has a population of more than 1200. Of the 225 houses in the camp, 125 are owned by the company

and 100 belong to the miners themselves. This plan of having the men own their own homes has resulted in bringing a less transient class of labor.

Among the men employed in the mines the Finns make up the predominating nationality and they make first-class workmen. Of the other miners 90 are Japanese, and there are many Italians. Probably no race of laborers in America is so temperate as the Finnish; in fact, at nearly all coal plants where these men are employed there are flourishing temperance organizations, and the life of the community is quiet and orderly.

Although the mining companies along the Oregon Short Line and Union Pacific railroads have been obliged to keep constantly after the railroad officials in order to obtain a sufficient number of cars, the general transportation problem has been better handled than in most parts of the country. Practically no shut-downs due to lack of cars have been experienced and during the past fall the railroad service has been better than at any time for many years. More eastern cars have been secured than ever before, and advantage has been taken of this condition to relieve the transportation problem in the West.

Owing to the shut-down of the smelters in Montana, the mines of the Amalgamated Copper Company at Diamondville are furnishing 1000 tons more each day, for the domestic market, than was supplied for this trade last year. When the mines of the Union Pacific Coal Company at Rock Springs and Hanna are no longer able to supply the western market with fuel, because of the Hepburn law which goes into effect May 1, the Amalgamated mines and those of the Kemmerer Coal Company will practically be the only large producers in southern Wyoming. It is the opinion of many that the public will demand coal, and will get it, no matter by whom the mines are controlled. The people in the Northwest endured one winter without a sufficient fuel supply, and few of them believe in burning down one part of the house to keep the other portion warm.

The demand for coal in the West is increasing faster than the supply. Coal to Nevada sells at the mines in southern Wyoming for $2.50 f.o.b. cars. The freight from Diamondville to Goldfield, Nevada is $9, so that coal in that locality costs the retailer $11.50 a ton.

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Experiments made in Austria show that a vacuum resulting from a blow-out shot may amount to as much as ½ in. of mercury which is equivalent to 8 to 9 lb. to the square foot. This reduction of pressure creates an increase in the flow of fire damp in the ratio of 235 to 100. Under the conditions stated blow-out shots may furnish a considerable amount of gas that would not be driven from the coal under ordinary conditions.

## Colliery Notes

Because of cheap labor, India is able to deliver its coal at the pit mouth cheaper than any other country in the world. The average price per ton delivered on board freight cars is $1.40. There is a great opportunity for the introduction of coal-mining machinery in India.

The Po-shan mines of China produced in 1906, 7136 tons of coal. Briquets are now manufactured from the small coal mixed with coal-tar pitch. The first coal-washing machinery to be installed in the East has been set up by the Shantung Mining Company, which operates these mines. It has a capacity of 150 tons per hour.

In mines where a single track is used for cars passing in both directions, traffic should be so systematized that the cars passing over the various switches will alternate in direction. When this plan is adopted, an automatic switch can be used to advantage and thus save the expense of a man otherwise necessary to open and close each switch.

In preparing Colorado anthracite coal the percentage of culm that is in size below pea amounts to about 50 per cent. of the mine-run. To avoid the production of culm in the breaker it has been the custom in the Colorado mines to load mine cars with forks, having tines ¾ in. apart, similar to the forks used for coke. By this means much culm as well as rock and bone is separated from the lumps of coal in the mines.

The towboat "Sprague," the largest vessel of its class plying on the Ohio river passed down the river at Connelton on Dec. 3, with a tow consisting of 45 coal boats, seven barges and two fuel boats carrying coal for the steamer. The tow was 800 ft. long and nearly 300 ft. wide. The boats were lashed together in the form of a parallelogram. It carried 1,300,000 bushels or 50,000 tons of Pittsburg coal for the New Orleans market.

An excessively high temperature in mine workings tends to lessen the daily output per man and is injurious to the health of the miners. The sudden change from one extreme of temperature to another when the miner comes out of the mine on a cold winter day, often produces disorders of the respiratory organs, and the inflamed surfaces are likely to collect dust from the air, one cause of chronic miners' consumption.

For an electric locomotive used on a long and heavy haulage road, the motor should be provided with a series and parallel controller, thus eliminating a considerable loss of power that would otherwise occur in heating the rheostats, when the motor is operated in series. This arrangement increases the life of the rheostats. When the motors are thrown in series the speed is nearly one-half of the normal speed at the rated draw-bar pull.

A large number of manufacturers have turned their attention to the use of slack coal and culm as fuel on account of the low figure at which it can be obtained; firing furnaces with these fine coals, however, requires great care and constant attention on the part of firemen, because of the dust which cokes and adheres to the bars, thus obstructing the air passages. Accordingly, at those plants where shavings, sawdust, etc., are produced, it is advisable to mix them with the coal dust so as to prevent, or at any rate diminish the coking.

To secure satisfactory service on an underground telephone line, good insulation is essential, for the chances of leaks are greater in mines than in ordinary aërial lines. In constructing a line underground it is advisable to choose the route least liable to disturbances from caves or from the removal of timbers. Place the line in an easily accessible heading or entry or traveling way. If the mine is equipped with electric power it is well to keep the telephone line as far away from transmission and trolley lines as practicable, and wherever it is necessary to carry telephone wires across power circuits, especial care should be taken to prevent accidental connection.

In some of the Welsh coal mines it has been the practice to whitewash the roof and sides of the gangways near the foot of the shafts. The prime object is not only sanitary and sightly, but it has been claimed that this method prevents the dust from accumulating along the road. When the whitewashing is to be done, two men are required. One man operates a hand air compressor; a suction pipe with a screened end draws the mixture of whitewash from the car, and the other man with the nozzle of the hose sprays the roof and sides of the road. The whole apparatus is so constructed that two men can handle and carry it to any desired place in the mine.

Careful attention to the construction of mine cars may mean a great reduction of possible future expenses, in the way of repairs, accidents, etc. The front and center binder irons for mine cars should be strong and heavy to prevent the cars from spreading under the weight of the load. Strong binders not only hold the cars together, but keep the smaller iron parts, such as bolts, etc., in better shape. The rear binder being subjected to less strain can be made of lighter iron. The ends of all draw-bars and all couplings should receive careful attention, for a break is apt to mean an expensive wreck. A mine truck should be rigid in construction, tightly bolted to the car bottom with axles at all times parallel to each other, for the life of the car depends mainly upon the construction of the truck.

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*Illustrated.*

# Coal-dust Firing for Reverberatory Furnaces

In the JOURNAL of Feb. 10, 1906, S. S. Sörensen, who was then engineer with the Utah Consolidated Mining Company, described some experiments with coal-dust firing for reverberatory matte-smelting furnaces. Notwithstanding various drawbacks which attended these experiments, they showed that the furnace fired with coal dust smelted 30 per cent. more ore than the average of the other furnaces of the works, and used 16 to 20 per cent. less coal (charging the dust-fired furnace with the coal equivalent of the power required to drive the pulverizer). Moreover, there was a saving in labor, inasmuch as the graters were not required and no extra attendance was necessary for the pulverizer.

Mr. Sörensen concluded his article with the following paragraph: "These results were considered satisfactory and a plant was discussed for applying this system of firing to all the furnaces. At that time, however, other improvements were introduced in the construction and working of the reverberatories, which, together with the difficulties of applying a general system of coal-dust firing to the existing plant, caused the system to be dropped. It is, however, certain from the tests we made that this method of firing is capable of very efficient results in reverberatory smelting in a plant properly equipped for the purpose."

Although the matter was thus dismissed from the attention of the management of the Highland Boy smeltery, Mr. Sörensen's article led to serious consideration by others of the possible advantages of coal-dust firing for copper reverberatories and during 1907 extensive experiments on the same line were carried on by the Cananea Consolidated Copper Company, at Cananea, Sonora. It was the intention of the metallurgists there to conduct these experiments to an ultimate conclusion, but unfortunately they were checked by the general shut down at Cananea a little while ago. Nevertheless, it is useful to put on record some of the difficulties experienced in the application of the new system, together with the data that promise a successful outcome.

During certain periods when operations were satisfactory, encouraging results were obtained, both in respect to saving of fuel and increase in the capacity of the furnace. The first trouble was a precipitation of carbon on top of the charge, which formed an insulating blanket, preventing any radiation of heat from the matte below and causing the formation of a sticky, gummy, slag, and consequently a great reduction in the smelting capacity of the furnace. This trouble was finally believed to have been overcome, but in the meanwhile more trouble was experienced through the flues filling up with ashes to such an extent that eventually they became clogged entirely. This necessitated a suspension of the experiments until a duplicate system of flues could be put in, whereof one set could be used while the other was being cleaned.

A deposition of ashes on the bath of slag in the reverberatory was anticipated, but it was not feared that this would give any trouble inasmuch as the slag should flux off the ashes in the same manner as the coke ash is slagged in blast-furnace smelting. It was found that a portion of the ash was indeed deposited and slagged, but a large portion was carried off through the flues, some escaping through the chimney and disseminating in the atmosphere. But for 10 to 20 ft. after leaving the reverberatory, the flue is so hot that the ashes adhere thereto as coatings, one on top of the other, and accumulate into a substance something like pumice stone, but not so hard. However, it was believed that all of these difficulties would be ultimately solved and that results would be obtained far in excess of what had previously been accomplished with reverberatories equipped with the ordinary fire box.

The difficulties experienced at Cananea appear to have been experienced also at the Highland Boy works, but in a less pronounced form. Mr. Sörensen said, "the ash dust did at times settle on the charge, but it was never enough to cause any appreciable insulating or blanketing of the charge; it did, however, gather a little in the flue and stack, but it was easily barred off."

There is good precedent for this application of coal-dust firing in the present practice of cement manufacture. The long revolving furnaces many of which exceed the length of the longest copper reverberatories, are now commonly fired with coal dust in such a way as to maintain a temperature of 1400 to 1500 deg. C., which is about the same as in a copper

reverberatory. The means for preparing the coal dust, introducing it into the furnace, eliminating danger of explosions, etc., have all been developed to a satisfactory point in the cement-making practice. The copper smelter has no need to go over the same ground. His attention may be confined to the solution of such purely metallurgical difficulties as have been experienced at Cananea.

The advantages of dust firing result from the combustion of the fuel in a manner similar to gas firing. The coal is so finely divided that intimate mixture with air is effected, and the combustion may be managed with the minimum excess of air over the amount theoretically required, which means, of course, economy in fuel. It is possible, moreover, to develop all the heat in the laboratory of the furnace, where it is wanted, and to effect a careful regulation of the temperature in the desired way, eliminating the irregularities that follow grating.

It does not seem probable that dust firing can offer any advantage over the large reverberatories with steam-boiler attachments which are fired in the ordinary way, inasmuch as the steam boilers are excellent recuperators of heat and the thermal efficiency of this combination is high. The difficulties arising from the deposition of ash would appear to preclude the attachment of steam boilers to a dust-fired furnace, at least in the case of Western coals high in ash. However, it is only in the large plants that steam boilers are used in connection with these furnaces. There are many plants which have reverberatories without any recuperation of heat and in many cases difficulty is experienced in creating the necessary conditions to burn effectively the badly clinkering or otherwise inferior coal that is the only fuel available. In such cases the application of dust firing offers a possible improvement that the experiments at Murray and at Cananea have both shown to be of much promise. It is to be hoped that further attention will be directed to this important subject.

## Miners, Smelters and Farmers

The outcome of the smelter-smoke question in Utah must be a source of amusement to the American Smelting and Refining Company, and indeed it would appear to have an entertaining phase if the latter were not so serious to the miners who have ore to sell. They are no more in a position to appreciate the joke than is the coon up a tree.

The neighborhood of Salt Lake City had developed into a great custom-smelting center and the competition experienced by the American Smelting and Refining Company became the severest that it had anywhere to meet; so severe indeed that certain of its rivals in cutting prices entered into ore contracts that were really unprofitable. Of course this was advantageous to the ore-producers.

In the meanwhile the agriculturists of the district took a hand in the game. It proved to be the winning hand, for now they have succeeded in closing all of the smelteries south of Salt Lake except the Murray plant of the American Smelting and Refining Company. That company early withdrew from the contest, paying the farmers a cash consideration for an agreement insuring subsequent immunity. Then the Garfield plant was erected, at immense expense, at a locality and under conditions guaranteeing it against claims for damages.

But all of the independent smelters having been put out of business, the competition that was so excellent for the ore-producers has also disappeared. There is now hardly the smelting capacity to take what they offer, that smelting capacity is wholly of the American Smelting and Refining Company, and it is rumored that the latter is interested only in long-time contracts at terms which the miners pronounce exorbitant. So it appears that the Utah miners may turn out to be the payers to the Utah farmers (and for some of the extraordinary expenses of the Garfield works), while the American Smelting and Refining Company figures as the benevolent stakeholder who gathers in a handsome commission, even if this be only a situation that it has tumbled into.

## Undercutting Before Blasting

The mining law which requires miners to undercut the coal seam before blasting is to be tested in western Pennsylvania. Criminal proceedings have been brought against a number of prominent foremen in the mines of the H. C. Frick and other coal companies, and an array of attorneys has been engaged by both sides to thresh out the question to a finish. The miners whom the foremen have allowed to mine without preliminary undercutting are also greatly interested, for the result will influence their earning capacity. The operators contend that if they are obliged to undercut the coal according to the way the inspectors interpret the law, more men will have to be employed, thus adding to the cost of the coal. They also hold that undermining proper in one mine may not be suitable in another. The inspectors insist upon undercutting in every case, because heavy blasts without this preparation are likely to shatter the roof and thus unnecessarily endanger the lives of the workmen. It will be an interesting legal battle, for it is said that according to the construction of the inspectors the law is being violated at practically every mine where coal is loosened by blasting.

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In a comparison of the temperaments of the two nations, it has often been remarked without contradiction that in mining the Englishman would always win out in the end because the American lacked the necessary patience. A report from the Elk Horn district, Montana, seems to throw doubt upon this statement. Two men, apparently good Americans, spent 22 years driving a tunnel into the side of a mountain entirely without help and without machinery, and apparently without much financial reward. The men, grown old in the solitary workings, drove 2300 ft. into the mountain besides cross-cutting at intervals. The account states that they are now installing machinery because the lack of air prevented their continuing in the old way.

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The Canadians have organized a "Shareholders Protective Association" with the avowed purpose of protecting investors from the pernicious activity of mining swindlers. The organization will see that the laws governing prospecting and the flotation of stock are obeyed, and will watch the industry in general. The formation of another association to protect the protective association is now in order.

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The bill relieving miners from the obligation to perform the assessment work for 1907 on unpatented claims passed the Senate, but failed to pass the House, and consequently did not become a law.

# Views, Suggestions and Experiences of Readers

**Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information**

## CORRESPONDENCE AND DISCUSSION

### The Silver-lead Deposits of Eureka, Nevada

The admirable description of the Ruby Hill mines, published in the JOURNAL of Dec. 7, is of the high quality which characterizes the work of Mr. Ingalls, giving evidences of great care in compilation and of close study of the economic, geologic and mining conditions. As it is therefore likely to mold the opinions of those who read it, this appendix is written to correct such erroneous impressions as may remain after its perusal. While Mr. Ingalls confines his description to the mines of Ruby hill, and the adjacent territory, the article gives one the impression that it is descriptive of the camp as a whole, and one is left with the impression that Eureka has no mines or prospects worthy of consideration aside from the Eureka Con and Richmond, and the Dunderberg properties—the former controlled by the United States Smelting, Refining and Mining Company, and the latter by interests working in harmony with it; that these properties are capable of producing ore of a grade not exceeding an average value of $10 per ton, that it is doubtful whether ore of such grade profitably can be transported 380 miles to the smelters at Salt Lake City, and that outside the lines of these properties there is nothing worthy the serious attention of mining men.

As Mr. Ingalls doubtless did not intend to produce such an impression, I beg to offer a few supplementary facts which may modify the unfavorable deductions naturally drawn from Mr. Ingalls' article.

In addition to the mines of Ruby hill (which were, it is true, the great bonanzas), the county assessors' records show that over 100 lessees and claim owners have shipped ore upon which returns were made for State taxation, and that of this number over 25 produced and shipped more than 1000 tons each. In computing the value of the output, it must be remembered that "shipping ore" was usually ore ranging from $40 to $200 per ton. These mines constitute the "Eureka mining district," and exist in a mineralized belt eight or nine miles long (north and south) and about two miles wide (east and west), including Prospect mountain, Mineral hill, Ruby hill and Adams hill.

The Silver Conner, Diamond, Williams, Matamoras, Cyanide group, Silver Lake group, Bullwhacker, Altoona, Wide West, Oriental, and many others, were considerable producers, and there is no reason to conclude that the ore within their limits has been exhausted. High smelting and transportation costs, the decline in the market price of silver and lead, and the governmental edict stopping the cutting of timber for charcoal making, were causes contributing to the closing of many of these mines.

The examples of mining and smelting costs in the 70's and 80's as given by Mr. Ingalls create an impression that the ores were mined and smelted at fairly low cost, and the inference is natural that abandonment occurred only after all the ore of fair grade was exhausted. The report of the president of the Richmond Mining Company, made to the directors and stockholders in 1892, summarizes the operations of that company for the 20 preceding years (1871-91). The figures given in this report are interesting, showing that the cost of mining, smelting, transportation of bullion and miscellaneous expenses averaged $40.50 per ton of ore treated. The gross returns during this period amounted to $28,170,070, the net profits were over $5,600,000, and the dividends a little less than $5,000,000. The ore mined by the company amounted to 465,297 tons, and the company purchased ore from other mines in the neighborhood amounting to 89,578 tons, thus smelting 554,875 tons. The product consisted of 83,183 tons of lead, 362,950 oz. of gold, and 11,022,465 oz. of silver.

During the same period the Eureka Con produced a considerably greater tonnage, and if the average value of its ores was the same as those produced by the Richmond company, then its gross costs per ton must have exceeded the Richmond costs of $40.50, for on a much larger tonnage it paid only a trifle more in dividends ($5,112,000) than the Richmond company.

The annual report of the United States Smelting, Refining and Mining Company made to the stockholders for the year 1906 (issued in 1907) states that a compilation made from the books of these companies shows a gross output of over $76,000,000 in value.

The above figures show a recovery of about $50 per ton of ore smelted, and if, as is generally supposed, the average assay value of ores treated was about $60, there must have been a loss in the slags and speiss and from volatilization of about $10 per ton. It is therefore apparent that ores assaying less than $40 per ton were unprofitable, and this is doubtless the reason for the adoption of the tribute or leasing system.

In explaining the ability of the Richmond-Eureka Mining Company now to mine and ship $10 ore at a profit, it is important to note the fact, not stated by Mr. Ingalls, that a freight rate of $2.75 per ton has been obtained on ore of this character assaying less than $12 per ton, this rate including shipment over the narrow gage railroad, trans-shipment at Palisade, and delivery to smelters at Salt Lake City.

The work of the U. S. Geological Survey in depicting and describing the conditions at the Ruby Hill mines is admirable in every respect. I have found it remarkably accurate, and upon this accuracy is largely based the prospecting, to which Mr. Ingalls refers, now in progress in search of the continuation of the Ruby Hill mineralization under the flat to the northwest—but I do not agree with Mr. Curtis, when that author reaches out beyond his observed facts and attempts to predict what may or may not be found beyond the developed area, and where the formation is hidden by gravel and "desert wash," nor can I agree with Mr. Ingalls in the conclusion "If the work of the U. S. Geological Survey be correct . . . the outlook in this direction is not flattering," for should ore deposits be found under this flat, constituting a continuation of the Ruby Hill deposits, the accuracy of the work of the U. S. Geological Survey would thereby in no wise be discredited, nor shown to be in error.

I believe also that Mr. Ingalls' conclusion that "the great concentration of mineral values was unquestionably within the Richmond-Eureka lines" should not be applied to the area outside that developed and prospected by past or present operations, for the northwestern extension of the belt through the Albion claims and under the flat to the northwest of Ruby hill is virgin territory, and it is entirely possible that it may contain ore deposits equaling or exceeding in value those developed and worked by the mines of Ruby hill.

In explanation of these comments, it is proper to state that I have made a careful study of the conditions to the west and northwest of the Ruby Hill mines; that I have found the work of J. S. Curtis as published in Monograph No. 7 of the U. S. Geological Survey remarkably accurate, but necessarily subject to such

revision as later discoveries require. All that is now known of this area is the fact that the shale (which is the hanging wall of the Ruby Hill mineralized limestone) extends about 2000 ft. northwestwardly from Ruby hill, and that the Ruby Hill limestone, which should underlie it, is, with the exception of one small outcrop, hidden by the desert gravel deposits.

Dec. 13, 1907. H. M. CHANCE.
Philadelphia, Penn.

## Valuation of Antimony Ore

What is the value of an antimony ore containing 80 per cent. antimony and 10 oz. silver per ton? A. B. C.

Melrose Highlands, Mass., Dec. 1, 1907.

(1) A commercial ore containing 80 per cent. antimony would be extraordinary. The list of antimony minerals and their antimony content are as follows, the sulphide and oxidized ores being separately designated:

| | Per Ct. | | Per Ct. |
|---|---|---|---|
| (s) Stibnite | 71.80 | (o) Senarmontite | 83.56 |
| (s) Chalcostibite | 48.90 | (o) Valentinite | 83.56 |
| (s) Berthierite | 57.00 | (o) Cervantite | 79.20 |
| (s) Zinkenite | 42.60 | (s) Kermesite | 75.30 |
| (o) Stilliconite | 74 90 | (o) Volgerite | 68.91 |
| (s) Durfeldtite | 30.52 | (s) Livingstonite | 53.12 |
| (o) Burunite | 50.11 | (s) Guejarite | 58.50 |

The most common ore of antimony is stibnite. Senarmontite, valentinite and cervantite are also commercial ores, but of these there are only two cases in which the pure mineral exceeds 80 per cent. antimony and anyone who could produce a commercial concentrate so high in grade would surely be an artist. The common standard for stibnite ore is 50 per cent. antimony.

(2) Valuable information as to the classes of antimony ore that are marketable, the methods of smelting and the market values are to be found in an article by F. T. Havard in "The Mineral Industry," vol. xv, pp. 43-48, to which reference should be made. The information in the following paragraphs is additional.

The market for antimony ore is confined to so few smelters that the price is chiefly a matter of private contract and sliding scales, such as are employed in the purchase of other ores, are but little, or not at all, used as a basis for antimony ore. However, Mr. Havard states that in May, 1906, dealers were still offering ores to smelters on the old formula of $V = 0.009\ T\ (P - 330)$, in which $V$ is the value of the ore in francs per 1000 kg., $T$ the units of antimony in the ore, and $P$ the price of antimony in francs. On this basis, an ore assaying 50 per cent. antimony, with the metal at £60 per 2240 lb., or 1485 francs per 1000 kg., would be worth 519.75 francs per metric ton, or roughly £21 per 2240 lb., or a trifle more than 8s. per unit. This old formula is converted into terms of U. S. currency and short tons by substituting $58 (as a close approximation) for the deduction of 330 francs. Then if antimony be worth £60 per 2240 lb. = $260 per 2000 lb., the value of 2000 lb. of ore assaying 50 per cent. antimony would be $90.90 or $1.82 per unit.

We have explained this old sliding scale to show how the prices now paid by the buyers of antimony ore compare with it. The meaning of the formula is, of course, that the smelter pays for 90 per cent. of the antimony content of the ore at the market price for the metal less 330 francs per ton of metal to allow for the cost of freight and smelting and the necessary profit. Mr. Havard states that the smelters using the English process estimate their working costs, including loss, at 200 @250s. per ton of metal produced. He states that the working costs by the French process amount to about 200 francs per ton of metal produced from ore containing 50 per cent. antimony. Of course as in all such statements it is doubtful as to precisely what is meant, i.e., whether the stated cost represents (1) direct operating without general expense, or (2) including general expense, or (3) direct operating, including general expense, plus amortization charges. The general meaning is either the first or second definition.

American buyers commonly make a basis of $1 per unit (22.4 lb.) when the metal is worth 8c. per lb., for ore containing about 50 per cent. antimony, with a variation of one-third of the difference in the market price for the metal per 2240 lb. up or down. Thus, with the metal at 8c. per lb., or $179.20 per 2240 lb., the value of an ore containing 52 per cent. antimony, is $52 per ton of 2240 lb. If the price for the metal is 10c. per lb., or $224 per 2240 lb., the addition of ⅓ ($224 — $179.20) = $14.93 is made, giving the ore a value of $66.93. Similarly at 6c. for the metal the value of the ore is $52 — $14.93 = $37.07. At 13c. for the metal this ore would be worth $89.33 per ton. The formula previously discussed would give $47.74 per 2000 lb. at 8c. and $94.54 at 13c.

The present American basis price of $1 per unit may become $1.05 or $1.10 if the ore be of particularly high grade, especially free from objectionable impurities and otherwise desirable. The determination of price for the metal is made in the usual manner, i.e., stipulations by agreement that it shall be the average of the month of arrival of the ore, or the average of the week preceding and the week following arrival, etc.

The subject of payment for the gold and silver content of an antimony ore is one upon which smelters are apt to be reticent. European smelters pay for the precious metals in some cases; in some cases they do not. Some smelters are able to recover the precious metals; others are not. The fact that no specific credit is made for the precious metals does not imply, however, that they are not being paid for, because they may be receiving consideration in the form of a higher price per unit of antimony than could be allowed if some portion of the gold and silver were not to be extracted profitably. In any case the allowance for the precious metals is a matter of private negotiation and is so variable as to be incapable of general quotation.

In fact the entire discussion of the subject of the valuation of antimony ore can be only of a general character. There are few buyers of the ore and when they are apathetic there is practically no market and the value of the ore is relatively much less than when there is a demand for it. The antimony business is one in which great mystery has prevailed with respect to the technical part. Of course this has stood greatly in the way of progress. The old methods of smelting, which still are largely practised, are crude and costly. The modern French process of volatilization is considerably more economical and affords a high percentage of extraction of gold and silver, which in the older English process of precipitation-smelting are recovered only with difficulty and incompleteness. The increased value of antimonial lead during recent years, which now sells for practically the full value of each of the constituent metals has made it profitable to produce that alloy by the combined smelting of lead and antimony ores (which of course are preferably both free from gold and silver) whereas formerly it was an undesirable by-product in the process of refining work-lead.

## The Labor Troubles at Goldfield

Various reasons have heretofore prevented any authentic statement of the labor situation at Goldfield from reaching the investing public. At this time such a statement seems particularly appropriate.

The Western Federation of Miners early intrenched itself in Goldfield and it is doubtful if any camp was ever more completely dominated by it. In December, 1906, when the record-breaking leases were about to expire by limitation, the miners struck for higher wages. The union scale at that time was $4.50 and $4, which was not in proportion to wages obtained by many other less arduous and less hazardous occupations in the camp. Notwithstanding the fact that many, if not all, of the bonanza leases were paying large bonuses to their men, wages in some cases being $7 to $8 per day of eight hours, the mine owners admitted the disparity in the amounts paid the various trades and despite the fact that mining conditions outside of the big leases did not justify it, they agreed to the new union scale of $5 as a minimum wage for all men employed underground.

The peace promised by this concession was short lived. The Western Federation of Miners was and is a constituent body of the Industrial Workers of the World and in Goldfield all union meetings were held by the I. W. W. members in general, and not by the individual local branches. Thus a miners' meeting was often largely composed of cooks, waiters, bartenders, and clerks, who could out-vote the miners themselves. The best element among the miners resented this and it was the seed which has sprouted to crush not only the I. W. W., but the W. F. M. as well.

In February, 1907, the I. W. W. promulgated a decree that the carpenters and allied building trades in Goldfield must renounce allegiance to their own unions, affiliations of the American Federation of Labor, and join the I. W. W., or, failing this, must leave camp or take the alternative of being run out. The carpenters failing to comply, the I. W. W.'s began flagrant persecutions and a few days later one Silva, who operated a restaurant which many carpenters patronized, was called to the door of his shop and shot and instantly killed by a member of the union. This dastardly outrage not being enough, threats were made to dynamite the town, and to kill certain of the prominent mining men, whereupon the better element rose *en masse,* armed themselves, fortified the Montezuma Club, patrolled the town, and waited for the miners to act. This state of affairs lasted several weeks. The mine owners and operators organized and closed down all of the mines of the district. They offered to reopen, making the stipulation that, while they were not in any way antagonistic to organized labor, they would insist upon the W. F. M. severing its connection with the I. W. W. and regaining control of itself and its own meetings. Grant Hamilton, an organizer for the American Federation of Labor, was brought in and organized many of the various trades and secured A. F. of L. charters for them. An agreement was finally reached and the mines reopened. The results of this trouble and lockout were as follows: The carpenters were allowed to conduct their own union; the wage scale remained the same, a $5 minimum; the miners agreed to change-rooms at the "high grade" mines and agreed further not to strike again in two years unless authorized by a two-thirds majority of a referendum vote.

Peace again seemed assured, but it was soon evident that trouble was brewing among the miners. High-grading or stealing of rich ore has been practised on an enormous scale since the discovery of the Goldfield bonanzas. Many fortunes were thus acquired. In August, change-rooms were installed at four mines owned by one company. Two of these mines were in bonanza ore, the other two contained no ore rich enough to steal. The day these change-rooms were put in operation trouble began. It is interesting to note that in the case of the first two mines mentioned, the high-grade mines, the men were embarrassed and humiliated by being obliged to undress and walk across the change-rooms, while in the two latter, the low-grade mines, the men, in a semi-nude condition, romped and played like school boys. Because of this alleged indignity put upon them, and despite their agreement not to strike for two years without a two-thirds vote, the miners in these two rich mines walked out. The mine owners, protesting to the union headquarters because of this violation of contract, were politely informed that no strike was known of; that the miners had the right to quit work when they pleased. So the production of the camp was again reduced from more than half a million dollars a week to the vanishing point. Finally concessions were made by the mine owners, slight alterations were made in the change-rooms and the miners returned to work.

When the financial panic swept the country in October, Goldfield could not expect wholly to escape its effects. In time it became necessary to pay the miners in scrip, and the miners, by advice of their head, who has just been tried for conspiracy in one of the foulest outrages in the history of mining, refused to work if paid in this scrip, although it passed current in Goldfield. Therefore Goldfield was once more thrown into convulsions and the local authorities being unable or unwilling to cope with the situation and there being no militia in Nevada, Federal troops were sent in.

It is evident now that no lasting peace can be negotiated with the irresponsible labor unions controlled by the I. W. W. and the W. F. M. The mine operators are not only not opposed to, but are willing and anxious to promote the welfare of, organized labor. Anarchy and socialism now rule the Goldfield labor situation and to these the mine operators are unalterably and eternally opposed. The best element among the miners have not been allowed to voice their sentiments in the union meetings. When their views were not in accord with those of the few radicals, they were howled down and finally they ceased to attend these meetings where their presence was useless and their persons were endangered. Many men were enticed to miners' union hall, were beaten and were taken out on the arid Nevada desert and told to "hike." Large red banners adorned the walls of the union hall, bearing these statements referring to the Boise trials of the heads of the W. F. M.: "For every hair of our brothers' heads we shall demand the life of a capitalist," and "If they pack a jury to convict our brothers we will pack hell with them."

Therefore radical measures were forced upon the mine operators, who are not a few bigoted plutocrats, but who are and who represent a vast number of stockholders throughout the country. The determination has been reached by them to stamp out forever W. F. M. and I. W. W. control of Goldfield labor. The mines will be reopened; the old miners who renounce allegiance to these vicious unions will be re-employed; the vacancies will be filled with non-union men; the former wage scale of $4 will be resumed; United States troops will prevent disorder, and Goldfield will return to its pre-eminent place among the gold camps of the world. May it all come quickly and without the price of blood. PERCY E. BARBOUR.

Goldfield, Nev., Dec. 24, 1907.

## The Divining Rod

I note in the JOURNAL of Oct. 26 a reference to the divining rod, taken from the U. S. Geological Survey. I was rather surprised to find that geologists in America still adhered to the opinions held by some geologists and some scientists on this side. I have made a study of the matter for some years past, and I carried out a number of experiments, and investigations, in connection with the then acting editor of *Water,* when I was editing *The Colliery Manager.* I approached the subject with the usual scoff, but I was converted at a comparatively early stage of my investigations by the solid fact that there are a number of men who are not geologists in any sense of the term, with no acquaintance with geology beyond such as they may have picked up in the course of their borings, who are making a good living by indicating water, and sinking wells where they indicate, on the understanding that if water is not found they are not paid either for indicating the water, or for the sinking. I have been credibly informed, that the yearly account of one water finder with one firm of well sinkers, who had no reason to believe they had all his business, exceeded £6000 per annum.

On this side since I carried through my investigations, I have acted as a sort of champion of the water finder, though I have no interest myself in the matter, beyond that which every engineer feels in every development of science. I make out that the cause of the phenomenon is the creation of a force, a form of energy, of which at present we have no previous knowledge. I need hardly remind engineers of knowledge and experience, that the solar spectrum occupies a very small portion of the possible field for forms of energy, nor that new forms are constantly coming to our knowledge with the constant questioning of nature that is taking place in every laboratory, and in every scientific mind. Furthermore, as we see that differences in the length of other waves, their form, their rate, etc.,

give rise to differences in their properties, I make out that it is only a natural consequence that there should be many forms, of which we know nothing, and that this may be one of them. I need hardly say that the force, whatever it is, is not electricity, but it obeys, according to my experiments, some of the laws which are common to electricity and other physical forces. It can be insulated.

I have had one or two bouts with the college physicists on this side, and in particular with Professor Barrett, the champion psychologist, and I claim to have driven him from the position he at first took up, viz., that the diviners were impostors. He has now retired upon subconscious cerebration.

SYDNEY F. WALKER.

Bath, England, Nov. 5, 1907.

## The Industrial Situation at Pittsburg

The truth is that, from the industrial point of view, the situation is not improving, says a correspondent of the *Evening Post*. No one can ride through the yards of the Pennsylvania railroad between Pitcairn and Union Depot, a distance of 15 miles, and not understand that the traffic under way is decidedly small.

Furthermore, statements made in the middle of December that wage reductions were not contemplated are now refuted by the announcement that the H. C. Frick Coke Company has ordered cuts affecting 30,000 men, to an average extent of 12½ per cent. The Pressed Steel Car Company and some minor concerns are reported to have made reductions, and there are signs that other reductions are anticipated. Common labor, which in 1907 reached the highest level and the least efficiency in many years, now freely offers its services at a reduction of 20 to 25 per cent. and sometimes more, below recent demands.

It is beginning to be seen that the settlement of the miners' wage scale, which terminates March 31, 1908, will present some of the hardest problems in years. With so much iron and steel capacity out of commission, and with the railroads using about a minimum quantity, the present demand for coal is light, and many mines in the Pittsburg district are idle.

New orders in iron and steel are exceedingly limited, and inquiry is meager. Some deferred orders are now being filled, and mills will operate more or less spasmodically in order to turn out spot material. The Steel Corporation is doing everything in its power to prevent exaggeration of reports about the business coming to hand, and is credited with doing practically nothing toward encouraging the railroads to buy material. It is reliably stated that cash is demanded, and the fact that some of the big railway systems are far behind in their general payments for material is not conducive to further wide extension of credit.

There has been some criticism of the United States Steel Corporation for selling 100,000 tons of sheet and tin plate bars to British manufacturers at a price around $19, whereas home consumers are charged $29 per ton. The independent manufacturers contend that such discrimination is harmful to them, as the bars will be made up into tin plate, and probably sold in the United States under the price at which American mills can turn out the product. Of course, the transaction is defended on the plea of keeping the mills in operation, but this argument is not as readily accepted as in the past.

## New Developments in the Goldfield Matter

Our record closed with the President's order to the troops to depart from Goldfield, Dec. 31. This order was revoked under the conditions set forth in the following telegraphic correspondence between the President and the Governor, which was made public Dec. 28:

Carson, Nev., Dec. 26, 1907.

The President, Washington:

As chief magistrate of the State of Nevada I have been of the opinion for the past year that a condition bordering on domestic violence and insurrection has existed in the Goldfield mining district. There has been an almost constant state of war between the miners' union and the mine owners who employ the members of the union. During the year 1907 practically one-fourth of the time was occupied in actual strikes and several months in agitation about other strikes. Without considering the merits of any of the controversies it is only necessary to state that the entire district became divided into two hostile camps; on the one hand the miners with their adherents and sympathizers, and on the other hand the mine owners with their adherents and sympathizers.

The union alone claimed a membership of 3000, and fully one-half of the membership were constantly armed. Arms and ammunition were purchased and kept by the union as a body. On the other hand, the mine owners had in their employ a large number of watchmen and guards who were constantly armed and on duty. In addition to these opposing forces were an unusually large number of the criminal element attracted to the new and booming mining camp. Under such conditions the civil authorities were practically powerless. They could attend to the ordinary petty offenders from day to day, but at the first conflict between the real armies of labor and capital they would have been swept away. The repeated strikes and continued threats of other strikes irritated the mine owners more and more.

It was clear to me, therefore, that when the last strike was called, in the midst of the financial crisis spreading over the country and with a long winter facing the 20,000 people situated upon the desert, hundreds of miles from any centers of population, it was time to recognize the actual condition of affairs and to act accordingly. A state of domestic violence and insurrection arises, in my judgment, when armed bodies are in existence with sufficient power to overcome the civil authorities, and continual threats are made of the destruction of life and property. This condition has existed in the Goldfield mining district the last year and exists there now. It calls for the presence of the troops to keep the peace. As this condition has been of slow growth it will take time to remove it.

In my judgment it is necessary that troops be kept at Goldfield an indefinite period of time. They should remain there until both sides are shown that the district is not to remain an armed camp and a scene of continual warfare. The communist and anarchist must seek new fields, the laboring man be convinced that arbitration and peaceful methods are more certain and lasting methods of improving his condition than by dynamite and the shotgun. This can only come about with time, and for the present and some time in the future the strong arm of the military must be in evidence to convince all that no other method will be tolerated.

It is known as a matter of legislative history that I recommended a measure at the last session having for its object the establishment of a State constabulary along the lines of the Texas rangers, which was rejected by that body, the members thereof still being in office. The Assembly of that session, with the vote of all but one, passed a resolution denouncing the injustice done Moyer, Haywood and Pettibone by the denial of a speedy trial. The resolution, however, was tabled by the Senate.

It is a matter of only a few weeks since I called for the opinions of different representatives and individuals of the State generally as to the advisability of convening a special session to act upon a then existing emergency which, however, did not relate to the present situation. The expressions received at that time indicated that 95 per cent. of the people were opposed to such extra session. For geographical reasons and on account of the customary ten days' notice to members it would be impossible to convene and organize a special session of the Legislature in less than three weeks presuming on the most expeditious action on the part of the members. For these reasons I deemed it impossible to convene the Legislature in special session to meet the present emergency and still think it highly inadvisable.

This telegram was in course of preparation on the 17th instant, in reply to your telegram of that date, but I was taken ill and have only just returned to my office. I am now sending it in lieu of the letter which I wired you was in course of preparation. The delay was not intended on my part and no discourtesy meant thereby. JOHN SPARKS, Governor.

The President's message in reply is in part as follows:

The White House,
Washington, Dec. 28, 1907.

To the Hon. John Sparks, Governor, Carson City, Nev..

Your telegram December 26 is received. It in effect declares that you have failed to call the Legislature together because in your judgment the Legislature would not call upon the Government of the United States for the use of troops, although in your opinion it ought to do so.

The Constitution of the United States imposes, not upon you but upon the Legislature if it can be convened, the duty of calling upon the Government of the United States to protect the State of Nevada against domestic violence. You now request me to use the armed forces of the United States in violation of the Constitution because in your judgment the Legislature would fail to perform its duty under the Constitution. The State Government certainly does not appear to have made any serious effort to do its duty by the effective enforcement of its police functions. I repeat again what I have already said to you several times, that under the circumstances now existing in the State of Nevada, as made known to me, an application from the Legislature of the State is an essential condition to the indefinite continuance of the troops at Goldfield.

Circumstances may change, and if they do I will take whatever action the needs of the situation require, so far as my constitutional powers permit. But the first need is that the State authorities should do their duty, and the first step toward this is the assembling of the Legislature. It is apparent from your telegram that the Legislature of Nevada can readily be convened. You have fixed the period of three weeks as the time necessary to convene and organize a special session. If within five days from the receipt of this telegram you shall have issued the necessary notice to convene the Legislature of Nevada I shall continue the station of the troops at Goldfield during such period of three weeks. If within the term of five days such notice has not been issued the troops will be immediately returned to their former stations.

THEODORE ROOSEVELT.

On Dec. 30, Governor Sparks informed the President that he would call a special session of the Legislature. In the meanwhile, according to the latest press despatches, the striking miners are abandoning the union and gradually returning to work.

## Association of Igneous Intrusions with Idaho Orebodies

BY ROBERT N. BELL*

The lead-silver deposits of the Cœur d'Alenes are noted for their occurrence in simple fault fissures, usually in a quartzite country rock, in contrast to the conspicuous association of limestone and igneous rocks so characteristic of other lead districts. In the Cœur d'Alene district intrusive rocks are not of frequent occurrence, but recent disclosures indicate that dikes and faults bear an important relation to some of the noted orebodies.

At the Morning mine a dike of massive diabase cuts obliquely across the vein in the vicinity of the large orebodies. This is also true of the Standard orebody where a small dike of black material crosses the vein on the 1200-ft. level below the Campbell adit; this produces no displacement, but nevertheless it seems, from recent developments, to be associated with an enrichment of the fissure, since a body of ore 10 ft. wide, much of which is of shipping grade, occurs nearby. At the Hercules mine a strong dike of rotten diorite occurs on the hangingwall of the rich orebody down to a depth of 1000 ft.; there this dike leaves the hangingwall side near the center of the orebody and is found again in the footwall near the west end of the orebody, where it makes a sharp angle with the strike of the vein; the displacement amounts to about 150 ft. A soft yellow dike of the same kind appears in connection with the rich ore-shoot recently found at the Tamarack & Chesapeake mine.

### THE HECLA OREBODY

The most interesting phase of ore development in the Cœur d'Alenes in this connection is that of the Hecla mine at Burke. This mine was opened as deep as the level of Canyon creek by adits. Above the lowest adit level the vein was rather poor, so that its operation was not very profitable. It has since been developed by a vertical shaft 900 ft. deep from which three levels have been driven. The orebody, which is 1000 ft. long, has gradually widened in depth and at the lowest level is now from 10 to 25 ft. wide. This orebody is accompanied by a small dike of massive diabase that varies from a mere seam to 5 or 6 ft. in width. In the 300-ft. and 600-ft. levels, the ore usually occurs on one side of the dike, but occasionally there is a streak of ore on both sides. On the 900-ft. level, for the last 150 ft., the orebody is from 20 to 25 ft. wide, including about 5 ft. of dike rock; high-grade ore occurs on both sides of the dike, and occasional patches and pebbles of clean, steel galena are found inclosed in the hard, fine-grained blue-black dike rock—an interesting phase of lead-ore deposition and suggestive of equal permanency in depth with the dike itself. This property has a large reserve of high-grade ore, and the rapid increase in width in the lower development, together with its unique association of a true igneous rock, presents probabilities of its permanency.

So far as I am aware, no dike rocks have thus far been developed in the big Wardner lode, yet it is not unlikely that the remarkable increase in the size and value of the orebodies in the deeper levels of the Bunker Hill & Sullivan, 3000 ft. below the vein apex, may be due to the near approach of deeply buried igneous rocks that seem to have a definite relation to the genesis of the orebodies in the Canyon Creek mines.

### CONDITIONS IN OTHER DISTRICTS

The bonanza stopes of the original De Lamar mine, in Owyhee county, terminated abruptly at what is called an iron dike, but which is probably a large fault-plane of soft blue clay impregnated with iron sulphide. Extensive development on the opposite side of this plane of movement has failed to disclose the continuation of these famous oreshoots. The rich orebodies of the Minnie Moore mine, on Wood river, together with some small diabase cross-dikes, terminate abruptly at a vertical fault-plane on the 1000-ft. level. The Kentuck mine, in Lemhi county, was faulted at a depth of 500 ft. by a dike of greenstone which cut the vein at an oblique angle. The displacement was very slight and the richest stopes of the mine were opened on each side of the fault.

*State mine inspector, Boise, Idaho.

## Gold and Platinum in Colombia

From a German railway constructor and mine prospector, who has for some years been investigating Colombia's possibilities, Consul Isaac A. Manning, of Cartagena, learns that the Choco and San Juan districts of Colombia are rich in gold and platinum, but until they are tapped with routes of communication, over which provisions and machinery can be taken to the mines, there is little hope for their development. Very little in the way of provisions is at present to be had in those districts, and hence the mining is left to the natives, if washing the gravel from the bars in wooden bowls can be called mining. Sluice boxes, rockers, or any modern mode of placer working are untirely unknown. In the platinum belt there are special agents purchasing that metal for France and England, and there would seem to be no reason why American merchants should not also become purchasers thereof. The metal is sold in Quibdo, according to reliable information, at $12 per ounce.

## Personal

Mining and metallurgical engineers are invite dto keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Wilbur E. Sanders has opened an office as consulting mining engineer at Los Angeles, Cal.

Neil McL. Curran, manager of the North Star mine, East Kootenay, B. C., has gone to England on a visit.

W. C. Thomas, manager of the Dominion Copper Company, in British Columbia, has been visiting Salt Lake City, Utah.

Frederick H. Minard, recently of Denver, Colo., has opened an office as mining engineer in the Trinity building, New York.

Charles F. Shelby, superintendent of the smelter of the Cananea Consolidated Copper Company, has been visiting New York.

F. B. Close is now with the Compañia Metalurgica y Refinadora del Pacifico, Fundicion, Sonora, as general superintendent of mines.

A. F. Kuehn has returned to Minneapolis, Minn., from Peru, South America, where he was in the employ of Frank Klepetko.

W. E. Lindsay, general manager of the Oregon Smelting and Refining Company, at Sumpter, Oregon, is in Milwaukee, Wis., on a visit.

R. P. Butchart, manager of the Vancouver Portland Cement Company, left Victoria, B. C., recently on a trip to New York and Mexico.

A. D. Moffat has resigned the superintendency of the Cactus mine of the Newhouse Mines and Smelters Corporation, at Newhouse, Utah.

Leslie G. Mott has been appointed assistant superintendent of the smelting works of the Mazapil Copper Company, at Saltiillo, Mexico.

R. N. Dickman, of Chicago, on Dec. 23 handed in his resignation as consulting engineer and as director of the Consolidated Zinc Company, of Chicago.

Andrew Colville, superintendent of the Coal Creek mine of the Crow's Nest Pass Coal Company, at Coal Creek, B. C., has resigned, and has gone to Montreal.

J. C. Kloppenstein, who has been for some time past in Nevada, is now in charge of the Grizzley mine in the Bohemia district, near Orseco, Lane county, Oregon.

Newton W. Emmens has returned to Pittsburg, Penn., from the Lardeau district of British Columbia, where for some time he had been engaged in opening up mining properties.

F. T. Congdon and J. R. Gray, of Dawson, Yukon Territory, have arrived at Ottawa to urge reforms in the mining laws and a reduction of freight rates on the White Pass route.

John Turnbach, of Pottsville, Penn., has been appointed superintendent of the Beaver Brook and Morca collieries. He succeeds E. L. Bullock, who has resigned after 37 years' service.

Glenville A. Collins, of Seattle, Wash., is consulting engineer of the Devine Mining Company, and has charge of the development work on the company's property at Gold Creek, Washington.

James F. Berry, formerly with the National Metal Company, of Mexico City, has accepted a position as chief chemist for the Compañia Metalurgica y Refinadora del Pacifico, at Fundicion, Sonora.

James Chynoweth, formerly manager of the Albany and Centennial mines, in the Lake Superior copper country, has been appointed general manager of the Hermina mine at Massey Station, Ontario.

W. D. Callender, for five years with the ENGINEERING AND MINING JOURNAL, two years as business manager, retired from this connection on Jan. 4. After a brief vacation, he will engage in private business.

W. S. Keith has resigned his position as general superintendent of the Oregon Smelting and Refining Company, at Sumpter, Oregon, to take effect Jan. 15. His address for the present will be at Seattle, Washington.

Milnor Roberts, dean of the School of Mines of the University of Washington, Seattle, Wash., has resumed his duties at that institution after spending the summer in southeast Alaska, directing the working of a mine there.

Cyrus Robinson left New York, on Dec. 31, for a two months' trip to Mexico. He will superintend the completion of two new smelting plants which are being erected according to his plans, one at Mapimi and the other at Teziutlan.

E. Stables, of London, has left British Columbia, on his return to England. For several months, until a recent suspension of work, he had charge of the Lenora mine at Mt. Sicker, Vancouver island, for the Vancouver Copper Company, of London.

A. H. Humpreys took charge of the mines of the Bituminous Coal Company, at Billings, Mont., on Jan. 1. He has for some time been at Beckley, W. Va., in charge of the Cranberry and Prosperity collieries of the New River Company.

John T. Glidden, for some time past on the editorial staff of the ENGINEERING AND MINING JOURNAL, has resigned, to accept an appointment as engineer with the Cerro de Pasco Mining Company in Peru. He sailed from New York, Jan. 4, on his way to Peru.

While the official announcement has not been made, it is understood that Thomas L. Lewis has been chosen to succeed John Mitchell as president of the United Mine Workers. He has been prominent in the affairs of the union, and has been vice-president for several years.

William B. Thompson has retired from the firm of Hayden, Stone & Co., and has become a special partner of the firm of Trippe & Co., members of the New York Stock Exchange. Mr. Thompson intends to devote a large part of his personal time to his extensive mining interests.

C. E. Beck, who has been assistant manager and engineer of the Sargent Engineering Company, Chicago, will succeed as manager of the company, C. E. Sargent, who has resigned to take charge of the gas-engine department of the Wisconsin Engine Company, Corliss, Wisconsin.

W. J. Turner, who has been president of the Lehigh & New England Railroad since its organization, has resigned and has been appointed first vice-president and general counsel. He will be succeeded by W. A. Lathrop, president of the Lehigh Coal and Navigation Company, while Rollin H. Wilbur will be vice-president and general manager.

James C. Dick has been appointed general superintendent of the Tintic Mining and Development and Yampa Smelting companies, in Utah. General Manager Charles W. Saxman is to make his headquarters in New York hereafter, and will have jurisdiction over the mines and smelter in British Columbia controlled by the syndicate operating the Utah properties.

J. E. Spurr, chief geologist for the Guggenheim companies, who has been investigating properties in California, Colorado, Missouri and Mexico, for the past three months, has returned to New York. Mr. Spurr has made a renewed arrangement as consulting geologist and engineer for the Guggenheim interests. On account of the advanced degree of progress which has been reached in the geological surveys and examinations of the Guggenheim properties, he will in the future be able to devote some time to other work.

## Obituary

William L. Conyngham, one of the wealthiest men in Wyoming valley, died at Wilkesbarre, Penn., Dec. 29, aged 78 years. He was for more than 40 years associated with Joseph Stickney, of New York, under the name of Stickney, Cnyngham & Co., sales agents for the Pennsylvania Railroad Company's anthracite coal. They handled some 5,000,000 tons a year. At the time of his death he was a director of the Lehigh Valley Railroad, a director of the Hazard Wire Rope Company,

and had large interests in many local corporations.

Dr. Peter Townsend Austen, a well-known consulting chemist, of New York, died Dec. 31. He was the son of the late John H. Austen and was born at Clifton, Staten Island, on Sept. 10, 1852. He was educated at private schools, the Columbia School of Mines, and the University of Berlin, received the degree of Ph.B. from Columbia University and of Ph.D. from the University of Zurich, and became an instructor of chemistry at Dartmouth College, professor of chemistry at Rutgers College, and also professor of chemistry at the Brooklyn Polytechnic Institute. Among the important places he had filled were chemist to the Richmond County Board of Health, Newark Aqueduct Board, Jersey City Board of Public Works, New Brunswick, N. J., Board of Health, Newark, N. J., Board of Health, and the New Jersey State Board of Agriculture. He was a member of numerous technical societies.

## Societies and Technical Schools

*Engineers' Club of Philadelphia*—On Jan. 11 this club gave a reception and house-warming, in celebration of the new club house, and also of the thirtieth anniversary of the organization of the club.

*University of Washington*—The special three-months' course for mining men at the School of Mines of this university, Seattle, Wash., began this winter on Jan. 6. There are no charges for tuition, the only cost being for materials actually used and for books. The equipment in stamp milling, concentrating, assaying, etc., is very complete.

*Colorado Polytechnic Society*—On Dec. 28 Geo. I. Finlay, professor of geology at Colorado College, read a paper on "The Gold Fields of Nome" before this society on the occasion of the annual dinner at the Antlers hotel in Colorado Springs, Colo. On Jan. 11 T. R. Countryman, Cripple Creek, Colo., will read a paper before the society at its rooms on "The Cripple Creek Deep Drainage Tunnel, and its influence on the Cripple Creek Mining District."

## Industrial

The Hewitt Mining Company has ordered from the Allis-Chalmers Bullock Company an air compressor for its mine at Silverton, B. C., in the Slocan district.

Robert W. Hunt & Co., inspecting and consulting engineers, have decided to establish a branch office and chemical laboratory in St. Louis, Mo. This office will be under the charge of Charles W. Gennett, Jr., who had an extensive experience in the Baldwin Locomotive Works, in the testing department of the Southern Railway and with the Atha Steel Casting Works, before engaging with Hunt & Co.

The ship yards of the great lakes have 42 vessels under construction for 1908 delivery, including 26 bulk freighters, for coal and iron ore. Of this program the American Ship Building Company is building 20, the Great Lakes Engineering Works nine, the Toledo Ship Building Company two, the Manitowoc Dry Dock Company three, the Racine Boat Manufacturing Company two, the Polson Iron Works three and the Collingwood Ship Building Company three.

During 1907 the lake shipyards, exclusive of the Canadian yards, launched 56 vessels, of which 40 were bulk freighters, three package freighters, one passenger steamer, one wrecker, one lighter, one mailboat, five tugs and four scows. Of these the American Ship Building Company launched 34 vessels. The Great Lakes Engineering Works launched nine vessels, eight being bulk freighters and one a package freighter. The Toledo Ship Building Company launched three bulk freighters.

The Goodman Manufacturing Company, Chicago, announces that the A. W. Wyckoff Company, Farmers' Bank building, Pittsburg, Penn., has been appointed exclusive selling agent for its electric coal mining machinery in the States of Pennsylvania, Ohio, New York, Maryland and in the Baltimore & Ohio district of West Virginia; and has assumed charge of the Pittsburg office. A. W. Wyckoff is president of the Wyckoff company and associated with him are W. B. Clarke and L. L. Brande.

The British Columbia Copper Company is installing at its Mother Lode mine, near Greenwood, B. C., a Farrel ore crusher having a jaw opening of 42x30 in. and a nominal crushing capacity of 150 tons per hour. The shipping weight of this machine is 120,000 lb. In ordering this crusher Frederic Keffer, engineer in charge of the mines, stipulated that it should have a bolted pitman instead of the old style of solid pitman heretofore in use, to facilitate renewal of babbitt bearings and repairing when necessary.

The Denver Engineering Works Company has issued a bulletin showing its standard electric hoists, ranging in capacity from 675 to 20,000 lb. rope pull. It contains standard specifications of these electric hoists, and each type of hoist is fully described. The company has discontinued the usual horse-power rating of hoists as being erroneous, and now always rates electric hoists by the rope pull at the drum, this rope-pull determining the strength of clutches, gears and brakes, whereas the horse-power will vary directly with the speed for a given rope pull. In the bulletin are given tables of interest to all users of hoists, especially electric hoists.

## Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Cyclone Drill Company, Orrville, Ohio. Drills. Pp. 28, illustrated, paper, 3½x6 in.

Wickes Brothers, Saginaw, Mich. Monthly Stock List. Pp. 32, paper, 3¼x6 in.; December 16, 1907.

Deister Concentrator Company, Fort Wayne, Ind. The Deister Ore Concentrator No. 2. Pp. 12, illustrated, paper, 5½x8½ in.

Chalmers & Williams, Chicago, Ill. Catalog No. 1. Section 1. Gold and Silver Mill Machinery. Pp. 44, illustrated, paper, 7x9 in.

Lehigh Car Wheel and Axle Works, Fullerton, Penn. The Fuller-Lehigh Pulverizer Mill. Pp. 46, illustrated, paper, 9x12 in., 1907.

Litchfield Foundry and Machine Company, Litchfield, Ill. No. 6. Hoisting and Haulage Engines. Pp. 32, illustrated, paper, 6¼x10½ in.

Fulton Iron Works, San Francisco, Cal. The Graupner Central Feed Centrifugal Roller Quartz Mill. Pp. 8, illustrated, paper, 8x10 in.

John A. Traylor Machinery Company, Denver, Colo. Bulletin E. The Imperial Ore Screen. Pp. 16, illustrated, paper, 7x9½ in. Bulletin H. Crushing Machinery. Pp. 12, illustrated, paper, 7x9½ in.

## Construction News

*Middleboro, Kentucky*—The Hignite Coal Company is arranging to open coal mines on Stony Fork, near Middlesboro. George Beach, Covington, Ky., is president.

*Kent County, Texas*—It is reported that a large cement plant is to built on lands in this county. H. J. Budd, Knoxville, Iowa, and R. C. Lomax, Fort Worth, Tex., are interested.

*Kanawha County, West Virginia*—The Kendalia Coal Company proposes to build a mining plant to handle 2000 tons of coal a day; also 100 coke ovens. A. S. Bell, Wheeling, W. Va., is engineer in charge.

*Frank, Alberta, Canada*—Announcement has been made that the Canadian-American Coal and Coke Company is making preparations to build 240 coke ovens, put in a coal-washing plant of 1000 tons daily capacity, and substitute a compressed-air haulage system for the rope and horse system it now employs. The installation of an electric-lighting plant and other improvements are also included in the comprehensive plans formulated. The company has been operating its coal mine at Frank about seven years. The capacity is now to be increased to at least 1500 tons per day. S. M. Moore, Frank, Alberta, Canada, is general manager.

# Special Correspondence from Mining Centers

**News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London**

## REVIEWS OF IMPORTANT EVENTS

### San Francisco

*December* 30—The Selby Smelting and Lead Company, of San Francisco, has been for some months conducting experiments in the direction of suppressing the evils of smelter smoke and has succeeded in condensing the sulphurous fumes almost entirely. The system is a mechanical one, electricity being used. The experiments, conducted on a practical scale, have resulted so successfully that Mr. Braden, the manager of the company, has received instructions to install a complete plant at the smelter on Carquinez straits, near Vallejo Junction. The sulphur is eliminated from the smoke, and is converted into sulphuric acid. Incidentally, it may be mentioned that the Selby company has no intention of building any new smelter at any locality in California, if it is prevented from building the one contemplated at Point San Bruno, on San Francisco bay, south of San Francisco, where already large sums have been expended.

The Four Metals Mining Company, of San Jose, owning properties 11 miles from Keeler, in Inyo county, has purchased the old Cerro Gordo mines, eight miles from Keeler, with mills and smelter as well as the concentrator at Swansea. The company announces its intention to equip the mines with modern machinery, build a tramway from mines to smelter and stamp mills and put the entire property in first-class condition. The Cerro Gordo mines have been among the large producers in the State. They have been shipping lead and silver ores as well as high-grade zinc ore.

The Ramona Cahuilla Gem Company has concluded over $8000 worth of development work on its group of gem mines in the Cahuilla district, in the San Jacinto mountains, Riverside county. This work is preliminary to the mining of the gems, and has been done under the direction of A. H. Whitson, superintendent.

The California Magnesite Company is about to commence opening its property near Winchester, in Riverside county. The raw material is to be shipped to Los Angeles, where a plant has been erected for its treatment.

What is considered to be an important bed of mica has been found by J. P. Ball, near Ivanpah, San Bernardino county.

The independent oil producers, acting as the Producers Sales Agency, embracing oil interests in Kern River, McKittrick, Sunset, Midway and Coalinga districts, have supported the declaration of independence of the officials of the agency, and voted without dissent that the association should at once proceed with the business of marketing its own oil. To this end the directors were authorized to construct pipe-lines to the railroads, build loading racks, provide for storage at San Francisco bay, secure contracts, etc.

Los Angeles mining men are agitating the question of trying to induce the Government to remove the United States mint from Carson, Nevada, to that enterprising California city. One argument used is that the presence of a mint would be followed by the establishment of a smelter at Los Angeles, which has been talked about for many years. As for establishing an old mint in a new place it is hard to see any reason for it, for the mint is now in Nevada, while most of the gold and silver Los Angeles wants to coin is expected from that State, some also to come from Arizona and Southern California. The fact is that new plants would be required rather than antiquated machinery. The whole system of melting, refining, etc., has been changed within the past year in the United States mint at San Francisco, to meet the requirements of the service in an economical way, and reduce the number of employees. All the old system has been entirely done away with. During the past month, the San Francisco mint has been coining nearly $1,000,000 a day, and could do more with its present facilities if more labor were employed. If this one mint can continue to coin at that rate, no new mints are needed for this coast. The bullion production is not sufficient to require another.

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### Salt Lake City

*Jan.* 3—By the time this issue of the JOURNAL reaches its readers, every copper smelter in Utah affected by the order of injunction issued from the Federal court will have been closed. The victory of the farmers is complete and as a result of it, not only is there millions of dollars worth of property now idle, but thousands of men have been thrown out of employment in the smelters and mines, with little prospect of obtaining reingagement right away. This situation, coupled with the low prices prevailing for the metals has brought on an industrial depression from which it is likely to take months to recover. All of the big producing mines of Park City have stopped the marketing of ore and this includes three mines which have been on the dividend-paying list for some time—the Daly West, Silver King and Daly Judge. In the Tintic district, practically everything is at a standstill. In Ophir, the working forces have been trimmed to a development basis; Stockton is shut up tight; summed up, production from the lead mines has been almost wholly suspended. Only three strictly gold mines are on a producing basis at the present time—the Consolidated Mercur, at Mercur; the Jennie, at Gold Springs, a new gold camp in Iron county, and the Annie Laurie, of the Gold Mountain Consolidated, at Kimberly, Piute county.

While many of the copper mines have been forced to curtail or shut down, others are being operated at full blast, particularly the Utah Copper at Bingham, which is commonly known as a Guggenheim, or American Smelting, enterprise. This one mine yielded approximately 3,000,000 lb. during the month of December and with eight sections of its mill in operation, the January output should be increased at least 500,000 lb. The Cactus mine of the Newhouse Mines and Smelters corporation produced a little in excess of 1,000,000 lb. of copper during December. The Yampa and Boston Consolidated resumed production in December, which, with the Salt Lake Copper Company's Copper Mountain property in Boxelder county, are about all the copper mines in Utah that have not been reduced to a strictly development basis. With the exception of the Yampa, which owns its own smelter, the mines referred to are the ones on which the Garfield smelter of the American Smelting and Refining Company is depending for its principal supply of ore; while the Nevada Douglas, at Yerington, Nev., is the source of its principal foreign supply. The Garfield smelter is being operated well up to its capacity, but a scarcity of lead ores is complained of at the Murray smelter of the American, which is going at less than three-quarters of its furnace capacity.

An unusual situation in the local ore market during the past four months has been the apparent lack of competition, which had been notably keen for several years previous, or ever since the advent of the United States company into the local field. This has been followed by such radical advances in smelting charges that many mining companies have refused to enter into the long-time contracts demanded of them and in some cases

stopped production rather than be subjected to new exactions. There have been few instances where contracts have been renewed on the former basis. This has stirred producers into independent smelter agitation, with the result that a large amount of local capital has been subscribed toward the enterprise.

## Butte

*Jan.* 3—The North Butte Company has made a temporary arrangement with the Original Mining Company, by which the latter will treat a limited quantity of North Butte ore at the Clark smelter. The North Butte, which was closed a month ago by the suspension of opera tions of the Amalgamated smelter at Anaconda, has therefore resumed mining, and is shipping about 200 tons of ore per day. Very few additional men were put to work by the company.

There seems to be a good prospect for a settlement of the smelter-smoke litigation which has been threatening to close the Washoe smelter of the Amalgamated Copper Company at Anaconda permanently. Since the smelter has been closed as a result of the curtailment policy of the Amalgamated company the "smoke farmers" have made overtures for a settlement; their experience resulting from the temporary closing of the big plant and cutting off their principal market, has made them realize what it would mean to close the plant permanently. Representatives of the farmers have been in New York in consultation with the Amalgamated officials, and one of them telegraphed to a friend in Anaconda that a settlement had practically been reached. It is understood that the company will, if the settlement is effected, purchase all the damaged farms at a fair valuation. In fact the company has already acquired a number of them since the smoke litigation has been pending. Since the decision by the United States Circuit Court of Appeals in the Utah smelter cases, and the temporary closing of the Washoe smelter by the Amalgamated, both sides to the litigation have shown a more conciliatory spirit, and a settlement now seems probable.

The independent mine-owners of the State have called a meeting to be held in Helena Jan. 16 and 17 for the purpose of organizing to fight the new smelter rates announced by the American Smelting and Refining Company for its East Helena smelter, which, the mine-owners claim, are an advance of more than 50 per cent. over the rates that were charged by the Washoe smelter and the competing smelters in Utah. After the Washoe closed and the Utah smelters ceased purchasing custom ore, the rates at East Helena and at Great Falls were raised. Mine-owners claim the rates are confiscatory, and that they are being forced to stop mining because they cannot operate at a profit. The mine-owners declare that if the smelters do not reduce their rates, they will build independent smelters throughout the State and will ask the Montana legislature to appropriate money to assist them.

## Denver

*Dec.* 31—In the case of the Lost Bullion Spanish mines promoters, who were convicted of conspiracy and fraudulent use of the mails, very light sentences have been passed, the judge stating that he would not impose the punishment that the facts justified. This seems to have been done chiefly in consideration of the wives and children of the defendants, who had already suffered greatly. Nothing was said, however, about the wives and children of the men who had lost their money in the venture. The fines and sentences were from $100 to $1000, and in addition, 15 days' imprisonment for Wilson, Cameron, Keables and Lawrence, and for Dubois, Dubois, Jr., and Blackburn, 30 days' imprisonment. All were allowed to find bonds in the sum of $1000 to await the decision of the Circuit Court of Appeals, to which they have announced their intention of carrying the case. Sebben, who made the report of fabulous riches in the cave, was let off with $1000 fine and costs.

The United States Reduction and Refining Company and the American Smelting and Refining Company announce a reduction of from 75c. to $2 per ton in treatment charges on ores from the Cripple Creek district, being the lowest rates yet given. The general manager of the Golden Cycle Mining and Milling Company is reported to have said that his company will not attempt to meet these rates, as they have long contracts sufficient to keep their mill going. Meanwhile this rate war will stimulate production and be a boon to the "low-graders."

The Union Pacific Railroad announces that, in accordance with the provisions of the rate law of last year, the Union Pacific Coal Company, which is owned by the railroad, will sell no more fuel to the public. As a matter of fact they have been unable to produce enough coal from their Wyoming mines for the use of their own operating department for several months, but it will prove a benefit to fuel conditions, as independent coal-mine owners there will now be able to ship their product, which formerly they were unable to do. It also emphasizes the great importance of opening up the 1200 square miles of coal lands on the line of the Moffat road in Routt county, Colorado, lying halfway between the Union Pacific on the north and the Rio Grande on the south.

## Scranton

*Jan.* 4—A bill is to be promoted by coal operators in western Pennsylvania at the next session of the State Legislature for placing a tax on coal and to have all other taxes on coal corporations removed. It is proposed to impose a tax of 1c. on each ton of bituminous coal mined, and burned into coke; 0.5c. on each ton of bituminous coal mined for other purposes, and 1c. per ton on anthracite mined. This would give the State a revenue of $1,960,736 based on the coal mined in 1905, which would be $696,120.23 in excess of the taxes now received from coal-mining corporations.

As a result of recent explosions, it is announced on semi-official authority in Harrisburg that Governor Stuart will, at the coming session of the Legislature, urge the passage of a new code of mining laws to safeguard the men employed underground.

A test slope is being sunk at Fiddlers' Green, Shamokin, by the Mineral company, to find No. 12 vein. This company has never worked this vein, although it is thought that it was partly worked from the old Lambert colliery more than 40 years ago. The slope is already 300 ft. deep.

A meeting of the Conciliation Board was held in Wilkes-Barre, when the grievance from No. 9 colliery of the Lehigh Coal and Navigation Company was considered. The employees maintain that they are being discriminated against in the wage scale and that they are not paid the proper rate for mining pillars. The company contends that it has been an invariable rule to pay the same rate for mining in the solid as for mining pillars. Disposition of the case was postponed.

## Toronto

*Jan.* 3—The Canadian branch of the Royal mint at Ottawa, was formally opened on Jan. 2 by Earl Grey, the Governor-General, who turned the lever which struck the first half dollar. It has been found that gold and silver from the smelters cannot be depended upon to be of the proper fineness; so a refinery is to be constructed in connection with the mint, at a cost of $15,000.

The Canadian government has issued an order-in-council canceling the present issues of leases granted, to mine for coal within the limits of Rocky Mountain park, and has substituted a new set of regulations. The duration of leases is fixed for 20 years, and they are made terminable at any time for non-fulfillment of conditions. The ground rent is fixed at $1 per acre, in addition to which a royalty of 5c. per ton will be collected on the output. The area to be leased to any one person shall be not less than 160 acres and not more than 640 acres. The lessee must commence mining operations within one year.

# Mining News from All Parts of the World

**New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents**

## THE CURRENT HISTORY OF MINING

### Arizona

*Douglas*—The Calumet & Arizona smelter will soon begin the enlargement of the 44x180-in. furnaces by the addition of 10 ft. to each, making the new furnaces 44x300 in. at the tuyeres.

*Copper Queen*—The smelter has put in a 40-ton Walker casting machine for pouring blister copper into thin slabs for shipment to the refinery. Owing to the high gold and silver contents which do not distribute evenly the slabs are made thin. In the ordinary course of the work only 14 min. are required from the tilting of the ladle until the slabs are loaded into railroad cars.

COCHISE COUNTY

*Tombstone*—Five mines are now running in the camp, three having been shut down during the slump. Of those running, four are operated by the Tombstone Consolidated. This company's 40-stamp mill is running full and more than 200 tons of ore per day is being crushed and treated.

### Arkansas

SEBASTIAN COUNTY

*Blocker Coal and Land Company*—This company has been organized to develop coal property near Fort Smith. The office is at Fort Smith; T. L. Wright and W. F. Blocker are the leading incorporators.

### California

AMADOR COUNTY

*Burlington*—Supt. Frank Bernardi has resumed operations on this mine, after a temporary shut-down owing to the financial stringency.

EL DORADO COUNTY

*Slate*—Thomas D. Drew has bonded the Scherrer property near Georgetown, which carries valuable beds of slate, and is interesting capital to open a quarry.

FRESNO COUNTY

*Sycamore District*—In this new district in the vicinity of Eagle Peak, five miles beyond Trimmer Springs, a large number of locations have recently been made. The ore found in the croppings yields gold in varying quantities.

HUMBOLDT COUNTY

*Gold Bluff Mining and Dredging Company*—The property of this company at Gold Bluff on the ocean coast has been leased by a Seattle, Wash., company, which is installing new machinery. J. J. Chapman is manager.

INYO COUNTY

*Four Metals Mining Company*—This company has purchased the Cerro Gordo properties with the concentrator at Swansea and the mill and smelter at Keeler.

*Great Western Ore Purchasing and Reduction Company*—Some 500 tons of zinc ore has been shipped to Denver, Colo., and 395 tons of silver-lead ore sent to the Selby works. The zinc ore comes from the 400 level and the galena from the 900 level of the mine.

MODOC COUNTY

*Discovery*—This company ran a tunnel in the Hoag district the past summer, and has completed its ditch to the mill site where the mill is to be erected in the spring.

MONO COUNTY

*Sweetwater*—Sayre & Jones have taken a lease and bond on this property in El Dorado cañon and will do considerable work there this winter.

NEVADA COUNTY

*Dublin*—Men have started work on this mine at Canada hill and will prospect the property.

*Murchie*—In this property at Nevada City, where good ore has recently been coming from the seventh and ninth levels, they have caught the vein on the 1000 level, at a point 375 ft. west of the shaft. It is good milling ore. Henry Fitter is superintendent.

*South Yuba Mining and Milling Company*—In this property on the South Yuba river, they have come upon specimens of native copper in No. 6 tunnel. Tunnel No. 7, at the level of the bed of the river, will now be run.

PLUMAS COUNTY

*George Scott*—D. M. Harvey, of Nevada, has purchased this mine on the North Fork of Feather river, between Greenville and Seneca. A double compartment shaft will now be sunk.

*Hewitt*—Hewitt Brothers, who have been hydraulicking and ground sluicing in Hopkins creek for some years, have found quartz at the head of the creek and are sinking on a 4-ft. ledge.

*North California*—This company is building a dam in Soda creek so as to divert the water by flume and ditch to the gold-bearing gravel lying high above the present river bed and extending down the East Branch to Halsted Flat.

*Plumas Mohawk*—This company has put up a large mill near Johnsville and is now ready to begin crushing ore. Only half the plant will be operated this winter.

SAN BERNARDINO COUNTY

*War Eagle*—This company has purchased from L. J. Carder, of Los Angeles, the Lead Queen group in Bagdad district and has mortgaged the mines for money for active development work.

SHASTA COUNTY

*Copper*—The Afterthought copper mine at Ingot has closed down and the Great Western Gold Company's smelter will close in a few days as soon as the ore on hand is treated. Work will not be resumed until spring.

*Garrecht*—This old mine, near Shasta, has been sold for $60,000 through H. O. Cummins, by Buckow, Schmitz & Remholz, of Keswick, to Eastern men.

SIERRA COUNTY

*Cleveland*—This mine at Sierra City, idle for many years, has been started up again by W. H. Griffiths, of Denver, Colorado.

*Red Star*—Superintendent L. P. Woodbury has completed the electric plant and has three shifts of men employed in the tunnel being driven to strike the ledge.

SISKIYOU COUNTY

*Champion Group*—On this property, O. H. Poor, superintendent, a contract is to be let for a 1000-ft. tunnel on the McKinley claims. Air drills will be installed and five stamps added to the mill. The mill and mine are to be electrically lighted.

*Humboldt-Siskiyou Mining Company*—This company, H. S. Hinzey superintendent, is now excavating for a new 10-stamp mill near the mine on the bank of Sugar creek. The mine is at the edge of Scott valley.

TRINITY COUNTY

*Golden Jubilee*—The old milling plant of this mine has been running all summer, and a new mill is nearly completed. Concentrating machinery and a cyanide plant are also being installed.

*Quimby*—At this mine on New river, where work has been discontinued for a year on account of difficulty among the stockholders, operations will now be carried on again by J. A. Brent, G. Duke, H. and A. B. Hammond, who now have control.

TUOLUMNE COUNTY

*Confidence Consolidated*—This company, at Confidence, has purchased new electrical equipment, comprising a number of Allis-Chalmers induction motors ranging from 10 to 75 h.p. for power service and a 50-h.p. Allis-Chalmers standard single-drum electric hoist for operation on a 60-cycle, 440-volt circuit, at 680 r.p.m. The hoist drum is 42 in. in diameter by 30 in. long. The normal load is 4200 lb. at a speed of 395 ft. per minute; length of rope, 1500 ft., in three coils.

## Colorado

LAKE COUNTY—LEADVILLE

*Aurora*—The work that is being done on the properties controlled by this company, Iowa gulch, is proving that the gold-bearing section of the district extends to the south. At the Ready Cash good ore is shipped from a winze sunk near the breast of the tunnel, and from the Aurora a small vein of good gold ore is being followed.

*Coronado*—This property, together with the Penrose, down-town section, has been closed down on account of low prices. The operators found it impossible to come out even. The pumps are still working, but they will probably be pulled in a few days, unless some arrangement is made with other operators in the down-town section to pay their proportion of the cost of raising the water.

*Eagle Group*—Work done during the week proves that the ore recently opened in this property, Big English gulch, is in place. The streak of rich ore in the main ore-shoot holds up in values and is being sacked.

*Grand View*—The owners are rapidly developing this property, Empire gulch, into a lead proposition of considerable importance. An incline is being driven, and as work proceeds the vein widens. The property is situated toward the head of the gulch.

*Little Jonny*—With the closing down of several of the low-grade propositions, a number of miners are taking leases on this property, and by the first of the year over 400 men will be at work. At present the four shafts are being worked steadily and the ore shipped from them will average 7000 tons per month.

*Penn*—This property, Breece hill, is shipping 200 tons daily of silicious and iron ores. There is a demand for iron, as the smelters require it for flux and they are doing everything in their power to encourage the industry. Leadville produces large quantities of argentiferous iron; the silver values pay the treatment charge and the excess in iron is a clean profit to the miner.

TELLER COUNTY—CRIPPLE CREEK

*Drainage Tunnel*—As was expected, El Paso Company has thrown up its contract on the drainage tunnel. Specifications are being drawn up and it is expected that new bids will be called for. At present some work is being done by the drainage company. The intermediate shaft has been sunk to about 100 ft. depth.

*Findley Consolidated*—This property, which recently started up after an idleness of some time waiting for the completion of the Golden Cycle mill to resume treatment of ore, is again shut down for a short time on account of a breakage in the counterbalance in the shaft.

*Gold Dollar Consolidated*—The annual meeting of the stockholders of this company was held last week in Cheyenne, Wyoming, and the following directors elected for the ensuing year: H. L. Shepherd, A. E. Carleton, J. J. Hughes, E. E. Quentin and R. J. Gafney. They are the same as last year. The report of the president shows the property to be in good shape. The property is being worked by lessees.

## Indiana

GIBSON COUNTY

*Fort Branch Mining Company*—This company, recently organized with a capital of $60,000, has elected the following directors: William A. Jackson, Willard W. Hubbard, Martha W. Jackson and H. N. Hubbard. The papers show that William Jackson, formerly sole owner of the Fort Branch mine, has sold a half interest in the Princeton Coal Mining Company to Willard W. Hubbard, of Indianapolis.

PERRY COUNTY

*American Cannel Coal Company*—This company, of Cannelton, has given notice that it will reduce its capital stock to $50,000.

VANDERBURG COUNTY

There was a bad cave in on Dec. 27 at the Banner coal mine, near Evansville, and the mine will be closed for two weeks or more. Over 100 miners are affected.

VERMILION COUNTY

*Jackson Hill Coal Company*—Abstracts have been completed covering 1100 acres of coal lands west of Clinton for this company. This is about half of the land on which the company holds options. Drillings have been completed and shafts will be started in April. Switches will be laid from the Walsh road to the mines.

## Kentucky

BALL COUNTY

*Hignite Coal Company*—This company has been organized to open coal mines on a leased tract on Stony Fork, near Middlesboro. The office is at Covington, Ky. George Beach is president; J. A. Downward, vice-president, and John Hoffman, secretary-treasurer.

## Missouri

JOPLIN DISTRICT

Many mines, where wages have been reduced, are operating at a profit and several others will reopen again as ore prices increase.

*Argosy*—Adam Scott has sold the mine, near Spring City, to Pratt & Colburn, of Syracuse, N. Y.

*Sheet Ground Prospecting*—R. K. Pitkin and others of Joplin have started to develop the 50 acres west of the Hero mine, near Joplin. Shafts are to be started at once on each of the five 10-acre tracts in order to prospect for "sheet-ground."

*Cassco Mining Company*—This company has completed arrangements for the erection of a modern mill on its lease on the Bonanza Lead and Zinc Company's land near Galena.

*Central City*—A company has been organized to reopen an old mine that formerly produced much lead ore.

*Pierce City*—A company is being organized to prospect ground about 1½ miles north of the old Pioneer mine. Good blende and silicate were found in that vicinity 15 years ago but nothing has been done since.

## Montana

It is reported that the American Smelting and Refining Company and the Amalgamated Copper Company have made an agreement, whereby the rates for smelting custom ores at East Helena and Great Falls respectively have been advanced about 50 per cent. This has excited great indignation among the mine owners, who have called a meeting, Jan. 16, to take steps to fight the smelters.

BUTTE DISTRICT

*Birdie*—This mine, the only tungsten producer in the Butte district, has been compelled to close because of the glutted condition of the tungsten market. The operators have a quantity of the ore in bins but can not dispose of it.

*British-Butte*—The shaft has reached a depth of 760 ft., and from the bottom of that a drill has been used to a further depth of 230 ft. without encountering bedrock. Values in placer gold have been obtained from the ground from the surface to a depth of 990 ft. The company expected to find bedrock, the bottom of an

ancient lake, at a depth of about 300 ft. The company is trying to determine by experiments and tests whether it will be profitable to mine the whole bed of gravel from top to bottom, or whether mining must be confined to the richer deposits near the surface and at the bottom of the shaft.

*Butte Continental*—It is reported on good authority that Charles Schwab's agents have for some time been in negotiation with A. V. Corry and associates for the purchase of the Corry group of copper claims in the Butte Continental section of the district. The Corrys own nearly 100 claims and they have showings of copper on a number of them.

*Butte Copper*—It is announced that this company expects to resume development work on the Trifle as soon as money conditions improve, arrangements having been made for funds.

*Butte & London*—Drifting on the large vein cut some time ago is still in progress and with improving results. The vein has a northeast and southwest strike. The copper assays increase as the drift goes southwest.

*La France*—The new process zinc mill of this company at the Lexington mine has been in operation several weeks, and superintendent W. A. Kidney reports that it is successful. It has been treating about 100 tons of Lexington ore daily, and separating all the metals—copper, zinc, iron, lead and silver. Several improvements are to be made in order to make operation more satisfactory, as the present method creates so much dust that it is difficult for laborers to work.

*Ophir*—Leasers are working on this mine of the Butte Central & Boston, but are not able to dispose of much ore, owing to the high rates charged by smelters and the very limited quantity of ore that is accepted by them.

*Tuolumne*—This company has cut a 24-ft. vein on the 1000-ft. level and is drifting on it; 18 ft. of the vein is composed of a very black talc, and 4 ft. of it is good ore.

## Nevada

### Esmeralda County

*Rawhide*—This new camp in the Walker Lake district is developing well. Many of the claims are being worked by lessees. About 20 of the leasing parties are raising rich ore and a number have developed promising ledges of milling ore. It is stated that orders have been placed for three quartz mills to be erected in the new camp. The principal travel to and from the new camp is by way of Schurz.

### Humboldt County—Rosebud

*Brown Palace*—Bard & Munn, the lessees, are doing extensive work on their leases at the Brown Palace. They are driving a tunnel to tap the ledge from which high assays have been received.

### Nye County—Bullfrog

*California*—The regular force of miners is now working in the tunnel. The ore is getting softer and more streaked. The tunnel is in 252 ft.

*Golden Scepter*—The crosscut tunnel on the Golden Scepter on Bonanza mountain, has exposed 35 ft. of manganese quartz and talc and the hanging wall has not yet been reached. The ledge is exposed at a vertical depth of about 150 ft. and its strength suggests that it will carry large shoots.

*Homestake*—There are about 40 men employed at the Homestake excavating for the foundation for the new mill.

*Mayflower*—A report from the Mayflower states that an excellent quality of mill ore is being penetrated by the drift from the crosscut on the 400-ft. level.

*Shoshone*—New screens have been installed at the Shoshone mill and operations at the plant resumed. The mill will be run at its full capacity. Sinking has been resumed.

### Nye County—Manhattan

*Mineral Hill*—Further development in the Mineral hill at East Manhattan is showing an improvement of the ore. The ore resembles that in the Thanksgiving, showing considerable free gold. The ledge averages from 5 to 7 ft. in width.

### Nye County—Tonopah

*Ore Shipments*—Shipments over the Tonopah railroad for the week ended Dec. 26 were: Tonopah company, 285 tons; Midway, 189; Tonopah Extension, 111; Jim Butler, 53; total, 638 tons. Ore sent to mills was: Tonopah company, 2160; Montana-Tonopah, 1100; Belmont, 800; total, 4060 tons.

*MacNamara*—In the western portion of the property an upraise has been run 70 ft. above the 350-ft. level, and the top now shows 4 ft. of ore.

*Midway*—A 25-h.p. hoist, operated by compressed air, has been installed. The winze is now down about 25 ft. The usual quantities of high-grade shipping ore are being extracted and raised from the 435-ft. level and between 100 and 200 tons of ore go forward to the smelter each week.

*Quincy*—J. C. Gladden, general manager of the Quincy Mining Company, will put a force of men to work on the property of the company, situated near Crow Springs, about 25 miles northwest of Tonopah.

### Nye County—Tybo

*Tybo*—The mine operated by the Nevada Smelting and Mines Corporation was recently unwatered and ore of high grade has been uncovered on the 300-ft. level. It is the intention of the corporation to erect a smelter at some convenient point between Tybo and Reveille, to reduce the ores from these camps.

### Storey County—Virginia City

*Pumping Association*—A special meeting of the Comstock Pumping Association, composed of representatives of practically all the mining companies on the Comstock lode, has been held in San Francisco to consider the needs of the Ward Shaft Association, which, for some time past, has lacked the funds necessary to install the new pumping plant to unwater the deep levels which have been flooded for many years. The result of the meeting is that the association has agreed to give the Ward Shaft Association $30,000 out of its reserve funds, and will also give an additional $5000 toward the reopening of the old drift that connects the Ward shaft and the Chollar Norcross-Savage Combination shaft on the 2400-ft. level. When that drift is reopened and the pumps installed in the Ward shaft, the water will be drawn off from the middle mines to that shaft and this, it is believed, will enable deep mining to be resumed in the middle part of the Comstock lode.

*Yellow Jacket*—According to President Slosson, a large orebody has been cut on the 1100-ft. level. It is over 18 ft. wide and extends downward as far as the 3000-ft. level.

## New Mexico

### Socorro County

*Bernal*—An explosion of gas and coal dust in this coal mine at Carthage on Dec. 31 killed nine miners and injured five others seriously, besides damaging the mine badly. The cause of the explosion has not been determined.

## Pennsylvania

### Anthracite Coal

*Kingston Coal Company*—A large washery is to be erected at Edwardsville, near Wilkesbarre, by this company. It will take the coal from one of the richest culm banks in the anthracite region.

*Lehigh Valley Coal Company*—No. 40 colliery of this company has been shut down, owing to the heavy inrush of water.

*People's Coal Company*—This company, at Scranton, distributed $20,000 among the miners and laborers in its employ at Christmas. The company adopts the profit-sharing plan, and makes the distribution according to earnings. The company operates the only strictly non-union mine in the anthracite region.

*Van Wickle*—A new stripping has been opened by the A. S. Van Wickle estate at Coleraine.

### Bituminous Coal

*Pittsburg Coal Company*—This com-

pany's statement for the 11 months ended Nov. 30 is as follows:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Earnings | $4,781,709 | $5,449,883 | I. $668,174 |
| Charges | 2,837,792 | 2,566,598 | D. 271,114 |
| Surplus | $1,943,997 | $2,883,285 | I. $939,288 |

Charges in 1907 included $684,615 for depreciation of coal lands by mining; $887,589 for depreciation of plant and equipment; $994,394 interest on bonds.

*Westmoreland Coal Company*—The company's report for the fiscal year ended Oct. 31 shows the following results:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Gross earnings | $1,256,808 | $1,473,426 | I. $216,618 |
| Expenses | 895,883 | 1,029,487 | I. 133,604 |
| Net earnings | $ 360,925 | $ 443,039 | I. $ 83,014 |
| Charges | 224,075 | 237,089 | I. 13,014 |
| Surplus | $ 136,850 | $ 206,850 | I. $ 70,000 |

The total coal mined was 1,192,302 tons in 1906, and 1,320,812 in 1907; an increase of 128,510 tons.

## South Dakota

LAWRENCE COUNTY

*Victoria*—A new orebody, 60 ft. long and 7 ft. wide, has just been discovered. As this is of good milling grade, the management announces that the mill will soon be started.

*Donaldson*—Apparently the drift from the bottom of the 80-ft. shaft near the Custer Peak company's property, is approaching the main vein; stringers of high-grade silver-gold ore have been found. Considerable work will be done this winter.

*Ama Queen*—Sherman Bros. are preparing to install a new pump to handle the flow of water; they will then develop the vein of free-milling gold ore, found some time ago.

*Octoroon*—Hank Walter has cut milling gold ore in some of the adits and shafts that he is driving on this property; some high-grade ore was also found. More men will soon be working at this mine.

*Homestake Extension*—The company has been reorganized with a $5,000,000 capitalization; working capital amounting to $150,000 has been pledged by the stockholders. Mr. McHugh, manager for the company, says that work will be resumed this winter. The company will purchase the adjoining claims, belonging to the New England Homestake Company.

*Iron Hill*—Lessee Ringley and associates will commence shipping in a few weeks. They have developed largely from the surface a body of high-grade silver-gold ore and opened up a vertical extending into the quartzite which was tapped by diamond-drill at a depth of 785 ft.

*Homestake*—The slime plant is now treating 1500 tons daily with a recovery of 91 per cent. The working force at the slime plant has been reduced to an operative basis.

*Gilt Edge Maid*—Milton Morris, of Rapid City, has been made superintendent of the cyanide mill; the mill is now handling about 175 tons per day.

*Imperial*—Two shifts are now engaged in sinking the old Dakota shaft which was 250 ft. deep when sinking was resumed; this is now 430 ft. deep. The shaft is now in porphyry, but it is hoped to strike the quartzite at a depth of about 500 ft

PENNINGTON COUNTY

*Holy Terror*—The United Mines Company, of New York, which has been operating under a lease, has just purchased the property for $460,000 from Charles Morgan, of East Orange, N. J., and associates. Work will be resumed on a large scale.

*Montezuma*—It is announced by Mr. Radcliff, the president of the company, who recently returned from New York that the property at Rochford has been bonded to the English syndicate that has taken options on many claims in the Black hills during the past few months.

*Mariposa*—N. M. Wade, of St. Paul, managing director, has been at the mine to inspect the new strike of high-grade gold ore. Development work will be pushed immediately; a mill will be erected in the spring.

## Utah

SALT LAKE COUNTY

*Utah Consolidated*—The mines and smelting works of this company were closed down Jan. 2, the company having failed to come to agreement with the farmers.

## Washington

KITTITAS COUNTY

*Devine Mining Company*—This company's mine is at Gold creek, four miles from the line of the Chicago, Milwaukee & St. Paul extension. The tunnel is now in 500 ft., on a 40-ft. vein carrying copper, silver and gold in sulphides. A concentrating plant is to be put in, to be ready by July. Concentrates will be shipped to the smelter, and another grade of ore will be treated at the mine. Glenville A. Collins, of Seattle, is in charge.

## West Virginia

KANAWHA COUNTY

*Kendalia Coal and Coke Company*—This new company has been organized to develop a tract of 1500 acres of coal land in Kanawha county. A mining plant will be installed and 100 coke ovens constructed. The capacity of the mines will be 2000 tons per day. Officers of the company are E. L. Perkins, president; A. S. Bell, vice-president and general manager; E. G. Perkins, secretary, and A. H. Werder, treasurer. A. S. Bell, of Wheeling, W. Va., is the engineer in charge of construction.

LOGAN COUNTY

*E. R. Johnson Coal Company*—This company is preparing to work a tract of 1600 acres of coal land which it has leased, on Crooked creek, near Logan. It is intended to install a mining plant to have a daily capacity of 1500 tons. Officers of the company are E. R. Johnson, of Detroit, Mich., president; Edw. L. Stone, of Roanoke, Va., vice-president, and J. B. Hudson, of Logan, W. Va., manager.

MARION COUNTY

*Pittsburg Steam Coal Company*—This company is arranging to open a coal mine and build coke ovens near Fairmont, the mine to be in operation by March next. George Porter, of Uniontown, Penn., is engineer in charge of construction work. Officers of the company are: W. D. McGinnis, president and treasurer, and J. R. Bailey, secretary and manager.

RALEIGH COUNTY

*E. E. White Coal Company*—This company has been organized to open a coal mine near Beckley. The incorporators are E. E. White, Veris Austen and F. M. Ritcher, of Mt. Carmel, Penn.; J. M. Humphrey, of Centralia, Penn.; R. S. Daddow, of Ashland, Penn., and others.

## Canada

ONTARIO—COBALT DISTRICT

*Ore Shipments*—Shipments of ore for the week ending Dec. 21 were as follows: Hudson Bay, 64,000 lb.; Kerr Lake (Jacobs), 43,700; La Rose, 43,730; Nipissing, 130,599; Nova Scotia, 181,000; total, 463,029 lb. Shipments for the week ending Dec. 28 were: King Edward, 62,250 lb.; Trethewey, 62,000; total, 124,250 pounds.

*McKinley-Darragh*—The Board of Conciliation appointed under the Lemieux act to investigate the dispute between the company and its employees consists of E. C. Kingsmill, of Haileybury, representing the company; J. A. Welsh, Cobalt, representing the men, and Prof. Adam Shortt, of Queen's University, Kingston, chairman.

*Nancy Helen*—Recently a vein of calcite, 1 in. wide, was struck at the 100-ft. level which is stated to assay 2000 oz. silver to the ton.

*Temiskaming*—A vein about 6 in. wide, reported to be rich, was struck in the crosscut at the 200-ft. level. This is the third vein encountered within 60 ft. in the crosscut.

*Townsite*—Development is progressing with a force of 40 men. The main shaft is down 126 ft. On the first level nearly 800 ft. of drifting and crosscutting has been done, and about 150 ft. on the second level.

ONTARIO—UPPER ABITIBI DISTRICT

*Somers Bay Location*—Preparations are being made to develop several claims containing 13 veins of gold-bearing quartz. A shaft is down 12 ft. on one 20-ft. vein which is said to carry $100 gold per ton. Molybdenite is also present.

NOVA SCOTIA

*Dominion Iron and Steel Company*—Approximate figures of the output of this company for 1907 are as follows in tons: Iron ore, 593,000; limestone, 352,000; coke, 409,000; pig iron, 256,500; steel ingots, 270,600; blooms, 237,500; billets, 71,000; rails, 129,000; rods, 64.500. The blast-furnace department broke the local record on Dec. 27 by turning out 1004 tons of iron. The company has booked orders to keep the plant busy for several months ahead.

## Mexico

At the last session held by the railway commission in the department of communication, Mexico City, it was decided to grant an increase in the freight rates on ores and metals asked by the Mexican Central Railroad. The commission is only an advisory body so that its decision is not final, but its recommendation is considered important. The railroads lost their fight for the immediate adoption of the increased rates, the commission granting until April 1 to adjust the arrangements of the mining and smelting companies. The commission recommended the following increases in the rates on ores and metals: On those having a value of over $50 per ton, 30 per cent.; on values between $25 and $50 per ton, 20 per cent.; on those under $25 per ton, 10 per cent. The commission also recommended the limitation of the liability of railroad companies for ores lost to $25 per ton.

GUANAJUATO

*El Rey*—El Rey de Guanajuato Mining and Milling Company is the name of a corporation organized to work 40 *pertenencias* adjoining the Sebolletas, San Pedro, and San Pablo mines, in Mineral Villalpando.

*Guanajuato Reduction and Mines Company*—This company with its 160 stamps is treating 15,000 tons of ore monthly. In the Cata and Tepeyac mines the company is opening up bodies of milling ore.

*Nueva Luz*—The Mineral Development Company has installed an air compressor on this property and from now on machine drills will be used in sinking the deep shaft which is expected to cut the mother lode at a depth of 2300 ft. The shaft is 1000 ft. deep; after it reaches a depth of 1500 ft. the company will receive a government subsidy of $100 for every additional meter sunk.

*Shipment of Bullion to France*—Gold and silver bullion to the value of about $270,000 was shipped to France during the last half of December from the Penguico, Peregerina and San Prospero mines of the Guanajuato Development Company and others of the Guanajuato district. The French company, the Sociedad Affinadora de Metales, which recently purchased the Nonoalco refinery from the National Metal Company will not have completed its clean up until Feb. 1, and in the meantime refines bullion at its European works.

CHIHUAHUA

*Ramon Corona*—The Compañia Minera Ramon Corona de Naica, S. A., a corporation formed about a year ago, has taken up its option on this mine near Naica. The purchase price is said to have been $200,000.

*Mexican Mines Corporation*—This company is reported to have struck copper ore of shipping grade in a crosscut on the 50-ft. level on its property at Aloloya.. Other crosscuts are being run on the 100- and 200-ft. level.

*Prieta*—A fire in the surface works of this mine at Parral recently caused damage to the amount of about $5000.

*Cigarrero*—Another strike of rich lead ore is reported in this mine in the Alanoloya camp at a depth of about 900 ft. A railroad has been completed to the ore bins from Baca station, five miles away, on the Parral branch of the Mexican Central.

*Oil in Chihuahua*—Oil in good quantities is reported to have been struck in three wells drilled by the Hearst estate and James Keane near Ojinaga in eastern Chihuahua, in the territory of the Kansas City, Mexico & Orient railway. The three holes lie in a straight line about 12 miles apart near the Rio Grande. The oil has a paraffin base.

SONORA—NACOSARI

*Oso Negro*—This old mine, formerly worked by James Kirk and associates, is now under bond and lease to Sol. Camp and others, of Reno and Los Angeles, and is said to be responding well to development work.

*Moody*—This mine of the Nacozari Copper Company that has been idle for some time is being examined by Smith & Walker, of Phœnix, Arizona. The property is opened by a 200-ft. shaft.

*Los Angeles*—This property of the Arizona Mining and Trading Company is reported to have passed under the control of a group of Western capitalists.

*El Tigre*—This mine is being worked at full capacity. The high-grade concentrates are being stored until better smelting arrangements can be made.

*Pilares*—At this mine of the Moctezuma Copper Company the force has been increased in anticipation of the early completion of the new 2000-ton concentrator that is expected to go into commission about April 1. At present the old concentrator is handling 800 tons per day.

## Europe

SPAIN

Exports of metals from Spain for the 10 months ended Oct. 31 are reported by the *Revista Minera* as below, in metric tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Pig and man. iron | 47,388 | 52,328 | I. 4,940 |
| Copper | 6,617 | 7,085 | I. 468 |
| Copper precipitate | 18,597 | 15,500 | D. 3,097 |
| Zinc | 1,020 | 1,293 | I. 273 |
| Lead | 148,501 | 153,478 | I. 4,977 |
| Quicksilver | 1,482 | 1,498 | I. 16 |

Exports of minerals for the 10 months were, in metric tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Iron ore | 7,862,846 | 7,444,273 | D. 418,573 |
| Copper ore | 932,942 | 1,022,577 | I. 89,635 |
| Zinc ore | 117,348 | 128,993 | I. 11,645 |
| Lead ore | 3,808 | 4,741 | I. 933 |
| Manganese ore | 85,207 | 57,127 | D. 28,080 |
| Pyrites | 865,921 | 1,112,127 | I. 246,206 |
| Salt | 372,744 | 423,262 | I. 50,518 |

Exports of sulphur were 844 tons in 1906, but dwindled to 2 tons in 1907.

## Africa

TRANSVAAL

Gold production in November was 549,901 oz. fine. For the 11 months ended Nov. 30, 1907, the total was: Witwatersrand, 5,657,543 oz.; outside districts, 210,425 oz.; total, 5,867,968 oz., or $121,290,899. For the corresponding period in 1906 the total was 5,236,450 oz.; showing an increase of 631,518 oz. this year.

WEST AFRICA

Gold production in November is reported at 25,389 oz. bullion, an increase of 1339 oz. over November, 1906. For the 11 months ended Nov. 30 the total was 202,187 oz. bullion in 1906, and 266,081 oz. in 1907; an increase of 63,894 oz The bullion reported in 1907 was equal to $5,111,048, or 247,269 oz. fine gold.

## Asia

INDIA—MYSORE

*Kolar Goldfield*—The production is gradually improving, the report for November showing 45,878 oz. bullion; being 70 oz. more than October, and the highest total for any month in 1907. For the 11 months ended Nov. 30 the total was 526,506 oz. bullion in 1906, and 497,616 oz. in 1907; a decrease of 28,890 oz. The bullion reported in 1907 was equal to $9,257,142, or 447,854 oz. fine gold.

## New Caledonia

Exports of minerals from the colony for the nine months ended Sept. 30 are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons: Nickel ore, 75,943; cobalt ore, 2993; iron ore, 53; copper ore, 432; chrome ore, 21,466; magnesite, 42 tons.

# Metal, Mineral, Coal and Stock Markets

**Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks**

## QUOTATIONS FROM IMPORTANT CENTERS

### Coal Trade Review

*New York, Jan.* 8—The coal trade in the West opened the year quietly, with only moderate demand reported from most places. The demand for steam coal is not active, many manufacturing plants being closed, or partially closed, while the mild weather has kept down the sale of domestic coal. Operators generally are inclined to hold back, fearing to flood the markets.

In the East the bituminous coal trade is quiet also, the call for steam coal being on a more moderate scale than for many moinths past. The coastwise trade has been interfered with by stormy weather to an unusual degree.

#### Coal Traffic Notes

Shipments over Pennsylvania railroad lines east of Pittsburg, year to Dec. 28, short tons:

| | 1906. | 1907. | Changes |
|---|---|---|---|
| Anthracite | 4,541,749 | 5,630,022 | I. 1,088,273 |
| Bituminous | 32,204,912 | 39,459,630 | I. 7,254,718 |
| Coke | 12,679,357 | 13,008,110 | I. 328,753 |
| Total | 49,426,018 | 58,097,762 | I. 8,671,744 |

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad for the full year 1907 were 999,415 tons.

Coal shipments reported by Southwestern Inter-State Coal Operators' Association, 10 months ended Oct. 31, short tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Missouri | 1,971,305 | 2,324,029 | I. 352,724 |
| Kansas | 3,992,236 | 5,278,233 | I. 1,285,997 |
| Arkansas | 1,312,273 | 1,883,789 | I. 571,516 |
| Oklahoma | 1,856,993 | 2,385,586 | I. 528,593 |
| Total | 9,132,807 | 11,871,637 | I. 2,738,830 |

Oklahoma includes mines formerly reported under Indian Territory.

Coal receipts at Boston, full year; reported by Chamber of Commerce:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Anthracite | 1,659,679 | 2,053,328 | I. 393,649 |
| Bituminous | 2,859,844 | 3,184,964 | I. 325,120 |
| Total domestic | 4,519,523 | 5,238,292 | I. 718,769 |
| Foreign | 658,072 | 545,652 | D. 112,420 |
| Total | 5,177,595 | 5,783,944 | I. 606,349 |

Foreign coal is chiefly from Nova Scotia.

### New York

#### Anthracite

*Jan.* 8—The hard-coal market is fairly active in both prepared and steam sizes, with the exception of egg coal, of which there seems to be an abundance. Stove, chestnut and pea are scarce and in good demand. Prices are quoted as follows: Broken, $4.50@4.75; egg, stove and chestnut, $5; pea, $3.25@3.50; buckwheat No. 1, $2.75@3; buckwheat No. 2, or rice, $2.15@2.25; barley, $1.75; all f.o.b. New York harbor.

#### Bituminous

The soft-coal market is absolutely dead, with large stocks at tidewater, both at the loading and discharging points. A general embargo has been declared at one or two loading points and the prevailent idea is that a curtailment of shipments from the mines will be necessary if present conditions continue.

Throughout New England consumers have taken on large stocks of coal and their needs for some time to come have been supplied. In fact, some consumers have taken more coal than they actually required in order to accommodate certain shippers who really did not know where to place their product. Manufacturers throughout New England are not starting up their works as was expected, and until they do only a slight demand can be expected from this section.

In New York harbor good grades of steam coal are freely offered at $2.50 f.o.b. shipping points, and coal which is on demurrage has been offered as low as $2.20 per ton. A rumor is current that a change in the tariff from mines to tide on through railroads will soon go into effect. In the far East, along the Sound and, in fact, in all consuming territories the markets are dull and lifeless. Transportation from mines to tide is slow, coal requiring 10 days to two weeks to run through, but car supply is up to all demands except where embargoes are in force.

In the Coastwise trade vessels are in fair supply, but there is no demand for craft at present. Freight rates are as follows: From Philadelphia to Boston, Salem and Portland, 75c.; to Lynn and Newburyport, 90c.@$1 per ton.

### Birmingham

*Jan.* 6—Coal mining was resumed in Alabama a few days after the first holiday and at present the production is as heavy as it was before the holiday season set in. The railroads are giving good service. The readjustment in wages started in the ore-mining sections of the Birmingham district, then spreading to the furnaces and iron works, has at last reached the coalfields. There will be some changes made in the wages, save where contracts prevail, basing the mining wage on the average selling prices of iron. Inasmuch as the iron manufacturers are doing all they can to hold up the iron quotations, with but few orders coming in, it is expected that the coal miners will assist in maintaining conditions and accept the readjustment of wages without a struggle.

Coke is in a little better demand and the shipments are large. There is not much coke accumulated.

### Chicago

*Jan.* 6—With the needs of manufacturers curtailed and a mild winter throughout the country, the Chicago coal market is weak. Eastern coals, though very dull, are not so badly affected as Western, because shipments are more restricted. Illinois and Indiana operators continue to consign more coal than the market can well take care of. The consequence is low prices and an anxious scurrying of selling agents to find customers in time to escape heavy demurrage charges. The open winter has encouraged consumers and retail dealers to buy only for current needs and anthracite is selling but lightly.

Illinois and Indiana coals bring $2@3 for lump or egg, $1.65@1.85 for run-of-mine and $1.20@1.40 for screenings. Hocking Valley has been reduced 50c., making the new Chicago price $3.15. Smokeless is fairly firm and in relatively good demand, Pocahontas and New River bringing $3.30 @3.40 for run-of-mine and $3.85@4.25 for lump or egg. Youghiogheny is in very light demand, ¾-in. gas bringing $3.15 Chicago.

### Cleveland

*Jan.* 4—The coal market has not yet recovered from the holiday season, and little is doing. Contracts are reported for 40,000 tons of coke for delivery in the Cleveland district at a price slightly under $2 at ovens.

### Indianapolis

*Jan.* 6—Coal operators in Terre Haute, which is the greatest distributing point in the State, say that the coal-mining industry for the year 1907, which produced close on to 12,000,000 tons in Indiana, was the best year in the history of the business. The production was greater, and the prices obtained averaged higher than in previous years. The large production was due to the steady consumption of the manufacturing concerns for nearly 11 months, and the increase in the number of electric-power plants.

Practically all the coal mines were closed three days during holiday week, because of lack of orders. This closing down is a usual thing during holidays, especially if the weather is mild.

### Pittsburg

*Jan.* 7—Conditions in the coal markets show but slight improvement and the railroad mines are not running to more than 60 per cent. of capacity. Quotations remain on a basis of $1.15 a ton for mine-run coal at mine. On contracts, it is understood, this price can be materially shaded. The rivers have been navigable for over two weeks, and when the boating stage ended early this week, the harbor and pools were practically clear of loaded coal. There are plenty of empty coal boats and barges at the tipples and the river coal mines will be operated steadily for some time to capacity.

*Connellsville Coke*—The coke market continues dull and prices are weak, even on contract. Not more than half of the ovens in the regions are in operation and until there is a general resumption of blast furnaces it is not likely that much will be done. Furnace coke is quoted at $2@2.25, although sales for prompt delivery are reported to have been made at $1.75. Foundry coke has declined and is quoted at $2.50@2.75. Contrary to expectations, the H. C. Frick Coke Company revised wages and practically the same scale that was in effect from March 1, 1905, to March 1, 1907, was put in force on Jan. 1. It is explained that wages should not have been advanced last year when furnace coke prices were temporarily increased to $3 and more a ton. The price has dropped fully $1 a ton and it is regarded as no more than fair that the workers in the coke region should suffer part of the loss. Independent coke operators have followed the Frick company in making the reduction. It amounts to about 10 per cent.

## Foreign Coal Trade

Exports of coal and coke from the United States, 11 months ended Nov. 30, long tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Anthracite | 2,045,801 | 2,553,901 | I. 508,100 |
| Bituminous | 7,068,870 | 9,591,815 | I. 2,522,945 |
| Total coal | 9,114,671 | 12,145,716 | I. 3,031,045 |
| Coke | 705,988 | 813,914 | I. 107,926 |
| Total | 9,820,659 | 12,959,630 | I. 3,138,971 |

Coke exports are chiefly to Mexico and Canada. Coal exports were distributed as follows:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Canada, anthracite | 2,011,627 | 2,506,830 | I. 495,203 |
| Canada, bituminous | 4,929,717 | 6,687,686 | I. 1,757,969 |
| Canada, total | 6,941,344 | 9,194,516 | I. 2,253,172 |
| Mexico | 1,011,759 | 994,208 | D. 17,551 |
| Cuba | 604,321 | 709,593 | I. 105,272 |
| Other W. Indies | 285,781 | 407,815 | I. 122,034 |
| Europe | 80,977 | 210,547 | I. 129,570 |
| Other countries | 190,489 | 629,037 | I. 438,548 |
| Total | 9,114,671 | 12,145,716 | I. 3,031.045 |

Other countries are largely South American. Imports for the 11 months were as follows:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Great Britain | 99,539 | 37,994 | D. 61,545 |
| Canada | 1,300,978 | 1,258,654 | D. 42,322 |
| Japan | 10,812 | 106,158 | I. 95,346 |
| Australia | 168,662 | 486,616 | I. 317,952 |
| Other countries | 6,059 | 8,233 | I. 2,174 |
| Total coal | 1,586,050 | 1,897,655 | I. 311,605 |
| Coke | 118,135 | 122,738 | I. 4,603 |
| Total | 1,704,185 | 2,020,393 | I. 316,207 |

The imports are chiefly received on the Pacific Coast.

## Iron Trade Review

*New York, Jan.* 8—The markets have not recovered yet from the holiday quiet, and business has shown little change. New orders are not in evidence, though there has been some inquiry for pig iron, and some fair-sized contracts for structural steel are in sight. Much depends on the action taken at the conferences on prices which are being held this week. The indications are that the quotations will be maintained as far as is possible. The gradual improvement in money conditions will tend to restore confidence and bring out some business as the month advances.

*Lake Iron Ore*—The figures compiled by the Cleveland *Marine Review* from the returns sent in by the various dock companies show that iron-ore receipts at Lake Erie ports during the season of 1907 were 35,195,758 tons, out of a total movement of ore by lake of 41,288,755 tons. Lake Erie docks on Dec. 1 held a balance of 7,385,728 tons, which is the largest store on hand in the history of the traffic, the previous high figure being in 1902 when 7,074,254 tons were at hand. The figures are shown in the following table:

| Ports. | Receipts. | On Docks, Dec. 1. |
|---|---|---|
| Toledo | 1,314,140 | 518,645 |
| Sandusky | 83,043 | 44,546 |
| Huron | 971,430 | 415,730 |
| Lorain | 2,621,025 | 366,271 |
| Cleveland | 6,495,998 | 1,281,335 |
| Fairport | 2,437,649 | 523,981 |
| Ashtabula | 7,521,859 | 2,056,820 |
| Conneaut | 5,875,987 | 1,090,774 |
| Erie | 2,294,239 | 652,219 |
| Buffalo & Tonawanda | 5,580,438 | 435,407 |
| Total | 35,195,758 | 7,385,728 |
| Total, 1906 | 32,076,757 | 6,252,455 |

Shipments to furnaces between May 1 and Dec. 1, 1907, aggregate 29,787,018 tons compared with 27,615,392 tons in 1906, and 24,311,720 tons in 1905.

### Baltimore

*Jan.* 6—Imports for the week included 76 tons ferro-manganese and 268 tons silicon-spiegel. No arrivals of iron ore reported.

### Birmingham

*Jan.* 6—A number of sales have been made since the first of the new year by the Southern pig-iron manufacturers, but in almost every instance the business was in small lots. However, the feeling is encouraging. The statement is made that the Tennessee company will start up two of the furnaces at Ensley which have had banked fires for the past fortnight. Quotations for pig iron are looking up some. It is hard to get the manufacturers to say much about prices, but anything between $12.50 and $14 for No. 2 foundry appears to be the quotation. Rumors prevailed recently that a large consumer was in the market for a big lot of iron and made an offer at a certain price, but this could not be accepted.

### Chicago

*Jan.* 6—Pig iron opens the New Year with conditions that look better for the seller. Orders are increasing in number and tonnage, though not so largely as inquiries. The crossing of the bar between 1907 and 1908 brought no financial stress, but rather a restoration of confidence to melters. Stocks of iron are low everywhere. Present quotations are given as $13.50@14 Birmingham for Southern and $18.50@19 for Northern No. 2, for first-half delivery.

At the local iron and steel manufacturing plants production is going on at a reduced rate with the probability of expansion soon. There are no indications of a sudden rise,however; everything indicates a gradual return to better conditions.

Coke continues at $5.40 for the best Connellsville, with receipts well restricted to the light demands.

### Cleveland

*Jan.* 4—A better feeling prevails, but little business is being done. A number of plants start up this week, but these are mainly reopenings after the usual Christman holidays, and not much importance is attached to them.

### Philadelphia

*Jan.* 8—The interest which is felt in the probable course of pig iron at Southern furnaces is restraining active business in Northern irons for the time being. The tendency is still in the direction of shading prices, but nothing of importance will be done until the attitude of the Southern iron makers is determined. It is thought probable in furnace offices here that the Southern furnaces will not adopt any radical policy with reference to cutting prices. A small amount of business has been done in addition to one or two rather large contracts for forge iron, concerning which it is impossible to obtain any satisfactory details. The undercurrent of the market is naturally weak, but the prevailing quotation for No. 2 foundry is about $17, with a possible concession of 50c. for later deliveries. Sales of forge iron have been made within a

week at $15.50, with variations of about 25c. on each side. Buyers are not inclined to place large orders for spring delivery.

*Steel Billets*—Some business has been quietly done for delivery within 30 to 60 days, but the prices have not been disclosed. Forging billets are more active, but in a very small way.

*Bars*—Bar-iron people of this territory are only able to say that they are doing a moderate business in small lots on a basis of 1.76c. at tidewater. The local stores are distributing a little more iron since the first of the year on a basis of 2@2.20c. in small emergency lots.

*Sheets*—The restriction of output at mills continues and scarcely any important business has come.

*Pipes and Tubes*—Some renewals of contracts have been made since the first of the year, and, as terms are exceptionally attractive, it is regarded as probable that some large yearly contracts will be entered into as is customary.

*Plates*—The restriction of steel plate will still continue as the expected business which is generally placed in January is being held back.

*Structural Material*—Makers have picked up some small bridge orders for railroads and negotiations have been opened for a lot of bridge work in New England and Pennsylvania.

*Steel Rails*—Outside of the steel-rail offices the opinion is that orders will come in sluggishly. The railmakers themselves take a little different view of the situation. For the present orders are small.

*Scrap*—An improved demand in small lots has set in, which covers nearly the entire range of scrap. The demand is mostly local.

## Pittsburg

*Jan. 7*—There are several small bright spots in the iron and steel markets, but conditions are not as satisactory as are indicated by the many misleading reports that have been circulated lately about the return of prosperity. An official of a large steel concern who is familiar with affairs throughout the country said today that the brightest hope that can be entertained is that the mills will run to about 50 per cent. of capacity during January and February. It is expected that there will be a general slowing down in March and that dull conditions will prevail until fall or until the Presidential election is over.

As predicted last month the American Sheet and Tin Plate Company started about 50 idle tin-plate mills on Jan. 6, making the total number of mills running 97 out of 242. As already intimated, prices of tin-plate and sheets have been reduced, effective Jan. 6, tin-plate 20c. a box, galvanized sheets $4 a ton, and black sheets $2 a ton. Blue annealed sheets were reduced 5c. per 100 lb., making the new price $1.80 for No. 10 and heavier. Corrugated roofing was reduced 15c. a square on galvanized, to $3.10 a square; and 20c. a square on painted, to $1.75 a square. The decline in price of spelter is responsible for the cut in galvanized sheets. The new price is 3.55c. for No. 28 gage and black sheets have dropped from 2.60c. to 2.50c.

The Republic Iron and Steel Company has booked a number of good orders since the opening of the year and has received some large specifications on old contracts. In order to take care of this business it started the Bessemer steel plant and the Valley and Brown-Bonnell works yesterday and expects to keep the three plants running for at least two weeks. The Youngstown Sheet and Tube Company also resumed operations yesterday at its mills in the Youngstown district. The Homestead and Clairton plants of the Carnegie Steel Company continue in full operation and the Duquesne plant has started in full. The Edgar Thomson rail plant is running about half time. The New Castle steel plant is running full on tin-plate bars. It is likely that Mingo and Bellaire steel mills of the Carnegie company will resume soon to take care of a 100,000-ton sheet-bar order booked by the United States Steel Products Export Company for Welsh and English mills. This order was taken late in December and calls for delivery over the first six months of this year. The Jones & Laughlin Steel Company is running its big steel plant in full and has some good orders on the books.

*Pig Iron*—Only four merchant furnaces in the Valleys are in operation this week. There is practically nothing doing. The only sales of bessemer iron recorded so far this week were one lot of 100 tons and a carload. Both sales were at $18.50, Valley, at which price the large interests are trying to hold bessemer. It is believed, however, that $18 can be done. Basic is quoted at $16.75; No. 2 foundry at $17, and gray forge at $16.75, all f.o.b. Valley furnaces.

*Steel*—There is no change in the market for crude steel outside of a reduction of $2 a ton in sheet-bars and tin-plate-bars by the Carnegie Steel Company, making the price for the first quarter $29 a ton. Bessemer and open-hearth billets are still being held at $28, but a cut is expected. Plates remain at 1.70c. and steel bars at 1.60c., but a readjustment may be made at any time.

*Sheets*—The new prices are 2.50c. for black and 3.55c. for galvanized sheets No. 28 gage. The market is dull but there is some new buying.

*Ferro-manganese*—No sales have been recorded for over a week. The price is around $50 a ton.

# Metal Market

### Gold and Silver Exports and Imports

NEW YORK, Jan. 8.

At all United States Ports in Nov. and year.

| Metal. | Exports. | Imports. | Excess. |
|---|---|---|---|
| Gold: | | | |
| Nov. 1907.. | $ 615,169 | $63,463,036 | Imp. $62,847,867 |
| " 1906.. | 1,963,757 | 8,935,274 | " 6,971,517 |
| Year 1907.. | 54,211,240 | 98,837,722 | " 44,626,482 |
| " 1906.. | 44,828,263 | 147,962,143 | " 103,133,880 |
| Silver: | | | |
| Nov. 1907.. | 4,187,378 | 3,350,076 | Exp. 837,702 |
| " 1906.. | 4,561,830 | 3,351,981 | " 1,209,849 |
| Year 1907.. | 57,212,168 | 41,437,995 | " 15,774,173 |
| " 1906.. | 53,552,186 | 40,228,572 | " 13,323,614 |

Imports of gold at the port of New York for the week ended Jan. 4 were $5,311,901; of silver, $88,545. Exports of gold for the week were $14,030; of silver, $973,510.

The Treasury Department estimate of the money in the United States on Jan. 1, 1908, is as follows:

| | In Treasury. | In Circul'n. |
|---|---|---|
| Gold coin (inc. bullion in Treasury) | $ 188,951,451 | $ 648,573,173 |
| Gold certificates | 60,393,520 | 706,612,349 |
| Silver dollars | 42,554 | 91,312,428 |
| Silver certificates | 3,684,653 | 467,731,347 |
| Subsidiary silver | 4,650,135 | 134,980,859 |
| Treasury notes of 1890 | 9,944 | 5,469,056 |
| U. S. notes | 1,405,594 | 345,275,422 |
| Nat. Bank notes | 11,096,231 | 679,034,664 |
| Total | $270,234,082 | $3,078,989,298 |

Population of the United States, Jan. 1, 1908, estimated at 86,784,000; circulation per capita, $35.48. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money in the treasury as assets of the Government does not include deposits of public money in national-bank depositories to the credit of the treasurer of the United States, amounting to $245,566,944.

### Silver Market

SILVER AND STERLING EXCHANGE.

| Jan. | Sterling Exchange. | Silver. New York, Cents. | Silver. London, Pence. | Jan. | Sterling Exchange. | Silver. New York, Cents. | Silver. London, Pence. |
|---|---|---|---|---|---|---|---|
| 2 | 4.8460 | 54¼ | 25 1/16 | 6 | 4.8570 | 55 7/16 | 25 13/16 |
| 3 | 4.8480 | 55⅛ | 25 5/16 | 7 | 4.8550 | 58 3/16 | 27 |
| 4 | 4.8563 | 55 5/16 | 25¾ | 8 | 4.8530 | 57⅛ | 26 7/16 |

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs Pixley & Abell report silver shipments to the East for the year to Dec. 24:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| India | £ 14,867,196 | £ 10,541,354 | D. £ 4,325,842 |
| China | 430,700 | 457,350 | I. 26,650 |
| Straits | 1,750 | 691,150 | I. 689,400 |
| Total | £ 15,299,646 | £ 11,689,854 | D. £ 3,609,792 |

Imports for the week £96,000 from New York and £70,000 from the Straits; £166,000 in all. Exports, £40,000 to China, £53,300 to India and £17,500 to the Straits; £110,800 in all.

Indian exchange has hardened a little and Council bills to the amount of 25 lakhs of rupees were sold in London at an average of 15.91d. per rupee. Buying of silver for India continued very light.

Owing to the maturity of a large bear contract in London during the week, the price of silver was forced up beyond a normal figure to 27d. At that price the market was supplied and at the close of business on Tuesday sellers were in the majority.

### Other Metals

| Jan. | Copper. Lake, Cts. per lb. | Copper. Electrolytic, Cts. per lb. | Copper. London, £ per ton. | Tin. Cts. per lb. | Lead. Cts. per lb. | Spelter. New York, Cts. per lb. | Spelter. St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|
| 2 | 13⅝ @13⅞ | 13⅝ @13¾ | 61½ | 26½ | 3.55 @3.60 | 4.25 @4.35 | 4.10 @4.20 |
| 3 | 13⅝ @13⅞ | 13½ @13¾ | 61⅝ | 26¼ | 3.60 @3.65 | 4.30 @4.35 | 4.15 @4.20 |
| 4 | 13⅝ @13⅞ | 13½ @13¾ | ..... | 26½ | 3.65 @3.70 | 4.35 @4.40 | 4.20 @4.25 |
| 6 | 13¾ @14 | 13⅝ @13¾ | 61⅞ | 27 | 3.65 @3.70 | 4.35 @4.40 | 4.20 @4.25 |
| 7 | 13¾ @14 | 13⅝ @13¾ | 62¾ | 27½ | 3.60 @3.65 | 4.35 @4.40 | 4.20 @4.25 |
| 8 | 13¾ @14 | 13⅝ @13¾ | 61⅜ | 27 | 3.60 @3.65 | 4.35 @4.40 | 4.20 @4.25 |

**London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter brands command a premium.**

*Copper*—Considering that the volume of business is relatively small, the market is well maintained. This is in the main to be attributed to the firmness of holders, who have disposed of their near-by shipments and are quite willing to bide their time rather than sell futures except at a premium. Small transactions are reported for both home trade and export, but generally speaking, the tone is rather quiet throughout. The market closes steady at 13¾@14c. for Lake copper; 13⅝@13¾c. for electrolytic in ingots, cakes and wirebars. The average at which business in casting was done during the week is 13¼@13½c.

The standard market in London has fluctuated within narrow limits, without a pronounced tendency in either direction, and closes easy at £61 10s. for spot, £62 5s. for three months.

Statistics for the second half of December show an increase in the visible supplies of 1900 tons.

Refined and manufactured sorts we quote: English tough, £57@58; best selected, £65@66; strong sheets, £68@69.

*Copper Sheets and Wire*—Base price of sheets, 20c.; wire, 16¼@16½c. per pound.

*Tin*—The market in London has been steady throughout the week, and conditions in this market closely followed those abroad. The London market closes at £121 for spot, £122 for three months, while retail business in this market is being done at about 27c. per lb. for spot tin.

Statistics for the month of December show an increase in the visible supplies of 300 tons.

*Lead*—The market has quieted down. Manufacturers who have replenished their stocks have displayed a tendency to look on, pending a brisker demand from their customers. The market closes quiet at 3.60@3.65c. New York.

After advancing to £14 12s. 6d., the London market again began to sag, and closes easy at £14 for Spanish lead, £14 2s. 6d. for English lead.

*Spelter*—The demand from consumers and speculators continues unabated. Business has been restricted because buyers desire to place orders for future delivery, while, on the other hand, smelters are unwilling to book such business for the reason that they cannot cover with ore purchases. Joplin reports a very firm market, and the prices which are being paid for ore are considerably above the equivalent at which the metal can be sold. The close is firm at 4.35@4.40c. New York, 4.20@4.25c. St. Louis.

The European market is listless, and although the danger of exports from this side is past, there is no improvement in the tone, and the close is slightly lower at £19 7s. 6d. for good ordinaries, £19 12s. 6d. for specials.

*Zinc Sheets*—The base price is $7 per 100 lb.—less discount of 8 per cent—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

*Antimony*—A slightly better feeling prevails in the market, and considerable business has been done. Quotations are, 9@9¼c. for Cookson's; 8¾@9c. for Hallett's; 8@8¼c. for ordinary brands.

*Platinum*—Consumers have not been in the market to any extent for several weeks and this has caused a slight weakness. The metal is in such strong hands that prices have not suffered to any extent. Quotations are $28.50 per troy ounce for hard metal; $26 for ordinary; $17@18 for scrap.

*Nickel*—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities, 50@65c., same delivery.

*Quicksilver*—New York quotations are $45 per flask for lots of 100 flasks or over, and $46 for smaller orders. San Francisco quotations are $44.50@45.50 for domestic orders; for export nominal, at about $1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

*Aluminum*—The present price is 38c. per lb. for ingots.

*Cadmium*—The price is $1.25 f.o.b. Cleveland in 100-lb. lots. A higher price is asked for smaller lots.

### Imports and Exports of Metals

Imports and exports of metals in the United States for the 11 months ended Nov. 30 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor.

*Copper*—Exports in long tons, 2240 lb. each:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Great Britain | 22,436 | 29,180 | I. 6,744 |
| Belgium | 2,727 | 1,185 | D. 1,542 |
| France | 33,424 | 36,536 | I. 3,112 |
| Italy | 7,883 | 7,962 | I. 79 |
| Germany and Holland | 103,009 | 100,551 | D. 2,458 |
| Russia | 3,671 | 1,676 | D. 1,995 |
| Other Europe | 10,427 | 9,777 | D. 650 |
| Canada | 1,764 | 1,388 | D. 376 |
| China | 2,202 | 1,926 | D. 276 |
| Other countries | 231 | 297 | I. 66 |
| Total metal | 187,774 | 190,478 | I. 2,704 |
| In ores and matte | 4,983 | 6,576 | I. 1,593 |
| Total | 192,757 | 197,054 | I. 4,297 |

Imports, including copper in all forms, long tons:

| | Metal. | In ore, etc. | Total. |
|---|---|---|---|
| Mexico | 34,148 | 13,997 | 48,145 |
| Canada | 12,780 | 4,763 | 17,543 |
| Great Britain | 11,476 | ..... | 11,476 |
| Japan | 3,854 | ..... | 3,854 |
| South America | ..... | 3,215 | 3,215 |
| Other countries | 20,503 | 2,262 | 22,765 |
| Total imports | 82,761 | 24,237 | 106,998 |
| Re-exports | 398 | .... | 398 |
| Net imports | 82,363 | 24,237 | 106,600 |
| Net imports, 1906 | 71,625 | 20,661 | 92,286 |

Excess of exports over imports, 100,471 tons in 1906, and 90,454 in 1907; decrease, 10,017 tons.

*Tin*—Figures are in long tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Straits | 13,464 | 11,542 | D. 1,922 |
| Australia | 897 | 532 | D. 365 |
| Great Britain | 24,025 | 21,369 | D. 2,656 |
| Holland | 487 | 839 | I. 352 |
| Other Europe | 1,377 | 1,100 | D. 277 |
| Other countries | 243 | 105 | D. 138 |
| Total | 40,493 | 35,487 | D. 5,006 |

Exports were 765 tons in 1906, and 550 tons in 1907; decrease, 215 tons.

*Lead*—In short tons, of 2000 lb. each:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Lead, metallic | 11,425 | 9,164 | D. 2,261 |
| Lead in ores and base bullion | 65,586 | 62,973 | D. 2,613 |
| Total imports | 77,011 | 72,137 | D. 4,874 |
| Re-exports | 44,446 | 47,481 | I. 3,035 |
| Net imports | 32,565 | 24,656 | D. 7,909 |

Imports from Mexico, 56,991 tons; from Canada, 5503. Exports domestic lead, 53 tons, a decrease of 19 tons.

*Spelter*—Figures for spelter and dross in short tons; zinc ore in long tons:

| Exports. | 1906. | 1907. | Changes. |
|---|---|---|---|
| Spelter | 4,215 | 493 | D. 3,722 |
| Zinc dross | 13,590 | 8,924 | D. 4,666 |
| Zinc ore | 24,750 | 16,011 | D. 8,739 |
| Imports. | | | |
| Spelter | 2,192 | 1,768 | D. 424 |

Imports of zinc ores, July-November, 29,709 tons calamine and 3668 tons other ores; 32,377 tons in all. Not reported prior to July 1, 1907.

*Minor Metals*—Figures in pounds; with increases or decreases as compared with 1906:

| | Imports. | Exports. | Changes. |
|---|---|---|---|
| Antimony metal | 7,870,411 | ..... | I. 1,180,734 |
| Antimony ore | 2,668,902 | ..... | I. 878,162 |
| Nickel and ni. oxide | ..... | 8,221,889 | D. 1,662,288 |
| Quicksilver | ..... | 363,473 | D. 101,928 |
| Platinum | 5,726 | ..... | D. 4,835 |
| Aluminum, value | ..... | $299,588 | D. $20,327 |

Imports of nickel ore and matte 15,487 long tons, containing 17,081,281 lb. metal; an increase of 1677 tons.

## Missouri Ore Market

*Joplin, Mo., Dec.* 28—The highest price paid for zinc was $36 per ton, the base price ranging from $28 to $34 per ton of 60 per cent. zinc. Average price for the week was $31.74. Highest price paid for lead was $40 per ton, medium grades $36 @39, and an average of $36.98 for all grades.

The average price of zinc for the entire year 1907 was $43.68, against $43.30 for all of last year. The average price of lead for the year was $68.90, against $77.88 for 1906.

Shipments of zinc and lead from the district for week ended Dec. 28:

| | Zinc, lb. | Lead, lb. | Value. |
|---|---|---|---|
| Webb City-Carterville | 1,571,650 | 375,770 | $32,085 |
| Joplin | 1,097,430 | 141,590 | 20,797 |
| Oronogo | 689,770 | 85,420 | 13,048 |
| Galena | 618,160 | 59,930 | 10,689 |
| Badger | 495,980 | ..... | 8,431 |
| Duenweg | 450,930 | 24,000 | 7,656 |
| Alba-Neck | 362,250 | ..... | 6,158 |
| Aurora | 289,970 | 9,840 | 4,821 |
| Granby | 350,000 | 4,000 | 3,580 |
| Carthage | 184,900 | ..... | 3,143 |
| Zincite | 64,610 | 12,470 | 1,264 |
| Sarcoxie | 76,990 | ..... | 1,221 |
| Wentworth | 61,460 | ..... | 983 |
| Prosperity | 49,240 | 9,350 | 959 |
| Spurgeon | 65,990 | 24,030 | 892 |
| Carl Junction | 39,710 | 8,310 | 808 |
| Quapaw-Baxter | ..... | 42,110 | 778 |
| Reeds | 40,820 | ..... | 655 |
| Sherwood | 11,100 | 17,560 | 501 |
| Cave Springs | 29,470 | ..... | 442 |
| Totals | 6,551,430 | 814,380 | $118,911 |
| Year's total | 573,075,520 | 84,129,340 | $15,419,827 |
| Zinc value, the week, $103,983; | | year, | $12,521,423 |
| Lead value, the week, 14,928; | | year, | $2,898,404 |

*Jan.* 4—The highest price reported paid for zinc ore was $39 per ton, an advance of $3 over the previous week, the base price being advanced also, and ranging from $32 to $36 per ton of 60 per cent. zinc, all grades averaging $32.70 per ton. The highest price paid for lead ore was $45, an advance of $5 per ton. Medium grades sold at $44 per ton, and all grades averaged $44, very little low-grade ore being produced under the recent pressure of low prices.

Shipments for the week ended Jan. 4 were as follows:

| | Zinc, lb. | Lead, lb. | Value. |
|---|---|---|---|
| Joplin | 2,072,670 | 154,740 | $39,713 |
| Webb City-Carterville | 1,568,130 | 359,760 | 34,572 |
| Badger | 582,490 | ..... | 10,776 |
| Galena | 529,860 | 47,530 | 9,523 |
| Aurora | 458,610 | 9,500 | 7,307 |
| Duenweg | 281,370 | 80,120 | 6,545 |
| Alba-Neck | 327,120 | ..... | 5,951 |
| Granby | 450,000 | 10,000 | 4,050 |
| Spurgeon | 268,550 | 230 | 2,799 |
| Prosperity | 70,300 | 33,120 | 1,923 |
| Carthage | 62,500 | ..... | 1,156 |
| Sarcoxie | 63,020 | ..... | 1,071 |
| Zincite | 49,350 | 1,190 | 914 |
| Totals | 6,783,970 | 696,190 | $126,300 |
| Zinc value, the week, $110,979. | | | |
| Lead value, the week, 15,321. | | | |
| Same week last year | 11,170,580 | 1,624,500 | $322,162 |

Average ore prices in the Joplin market were, by months:

| ZINC ORE AT JOPLIN. | | | LEAD ORE AT JOPLIN. | | |
|---|---|---|---|---|---|
| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
| January | 47.38 | 45.84 | January | 75.20 | 83.53 |
| February | 47.37 | 47.11 | February | 72.83 | 84.58 |
| March | 42.68 | 48.66 | March | 73.73 | 82.75 |
| April | 44.63 | 48.24 | April | 76.13 | 79.76 |
| May | 40.51 | 45.98 | May | 78.40 | 79.56 |
| June | 43.83 | 44.82 | June | 80.96 | 73.66 |
| July | 43.25 | 45.79 | July | 74.31 | 58.18 |
| August | 43.56 | 43.22 | August | 75.36 | 59.54 |
| September | 42.58 | 40.11 | September | 79.64 | 53.52 |
| October | 41.55 | 39.83 | October | 79.84 | 51.40 |
| November | 44.13 | 35.19 | November | 81.98 | 43.40 |
| December | 43.68 | 30.87 | December | 81.89 | 37.71 |
| Year | 43.24 | 43.68 | Year | 77.40 | 68.90 |

## Wisconsin Ore Market

*Platteville, Wis., Dec.* 28—Highest price paid for zinc ore $44 per ton, on a basis of $33 for 60 per cent. ore. Base price for lead, $17 per 1000 lb., with no sales. Shipments for week ended Dec. 28:

| Camps. | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Platteville | 607,350 | 40,680 | ..... |
| Mineral Point | 260,000 | ..... | ..... |
| Hazel Green | 150,000 | ..... | ..... |
| Livingston | 140,000 | ..... | ..... |
| Linden | 120,000 | ..... | ..... |
| Cuba City | 88,000 | 45,000 | ..... |
| Highland | 49,300 | ..... | ..... |
| Benton | ..... | 82,600 | ..... |
| Total | 1,414,650 | 168,280 | ..... |
| Year to Dec. 28 | 99,556,437 | 5,215,760 | 462,360 |

For the week ended Jan. 4 the base price for zinc ore, 60 per cent., was $33 per ton; for lead ore $18 per 1000 lb. Shipments for the week were:

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Mineral Point | 300,000 | ..... | ..... |
| Cuba City | 220,000 | ..... | ..... |
| Dubuque | 200,000 | ..... | ..... |
| Platteville | 191,470 | ..... | ..... |
| Livingston | 150,000 | ..... | ..... |
| Hazel Green | 150,000 | ..... | ..... |
| Linden | 60,000 | ..... | ..... |
| Total | 1,271,470 | ..... | ..... |

*Correction*—In the review of the district production, in the JOURNAL of Jan. 4, page 90, it was stated that the top base price for the year for 60 per cent. zinc ore was $47. The figure should have been $50 per ton.

## Chemicals

*New York,* Jan. 8—The general market has not improved with the New Year and is dull and listless. Consumers seem to look forward to still lower prices and are holding off. Arsenic is weak and is being offered at about 5⅝c. for carloads.

*Copper Sulphate*—Buying is light and for immediate needs. Quotations are unchanged at $5.50 per 100 lb. for carloads and $5.75 for smaller lots.

Exports of copper sulphate from the United States, 11 months ended Nov. 30, were 18,702,625 lb. in 1906, and 6,880,858 lb. in 1907; a decrease of 11,821,767 lb. this year.

*Nitrate of Soda*—The market is quiet but firm, with evidences of slightly better demand for spot delivery. For future deliveries there are no inquiries. For all positions of 1908 carloads of 95 per cent. nitrate are being held at 2.42½c., while for 1909, 2.40c. is being asked. The 96 per cent. grade sells for 5c. per 100 lb. higher for all positions.

*Sulphur*—Imports and exports in United States, 11 months ended Nov. 30, long tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Imports: | | | |
| Sulphur | 69,232 | 20,089 | D. 49,143 |
| Pyrites | 515,692 | 590,108 | I. 74,416 |
| Exports: | | | |
| Sulphur | 14,320 | 34,891 | I. 22,571 |

Estimated sulphur in all imports was 275,510 tons in 1906, and 256,132 tons in 1907; decrease, 19,378 tons.

*Heavy Chemicals*—Imports into the United States, 11 months ended Nov. 30, in pounds:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Bleaching powder | 96,321,476 | 101,857,150 | I. 5,535,674 |
| Potash salts | 291,109,332 | 319,144,495 | I. 28,035,163 |
| Soda salts | 20,409,360 | 16,606,966 | D. 3,802,394 |

Exports of acetate of lime, 65,648,296 lb. in 1906, and 69,191,960 lb. in 1907; increase, 3,543,664 pounds.

## Mining Stocks

*New York, Jan.* 8—The opening of the year is characterized by an approach to more normal conditions in the money market than have been seen for some time. The banks are stronger and money more abundant. The immediate consequence is a stronger stock market, with more trading and a general tendency to advance on the extreme low prices that marked the close of the year.

The curb market followed the lead of the Stock Exchange. Copper shares and other mining stocks were stronger and dealings much larger. The coppers were especially active, though the gains were rather uneven.

### Boston

*Jan.* 7—The gradual settlement of the financial difficulties and the better supply of money are having their effect on the stock market. Dealings are larger, and prices at least no worse, though there is nothing like a boom or strong advance in sight yet. The market has been broader and prices have gained, though there was some easing off at the close today. Of the Lake coppers, Calumet & Hecla sold at $605; Osceola, $88; Quincy, $84; Copper Range, $59. Calumet & Arizona brought $106, while Utah Consolidated closed at $30.75; North Butte, $45.50; United States Smelting, Refining and Mining at $38.75. The best quotation of the day for Amalgamated Copper was $50, with close a fraction below.

The tone of the market is more hopeful than for several weeks, and the dealings were larger. The holidays seem to have had a beneficial effect.

The curb was fairly active, but coppers were rather neglected, the tendency being toward other mining stocks.

The plan announced for the reorganization of the Balaklala Copper Company provides for the formation of a new company and an assessment of $2.50 per share. The stockholders will meet Jan. 14 to pass on the plan.

## Salt Lake City

*Jan.* 4—The total sales of mining stocks on the Salt Lake Stock and Mining Exchange for the year 1907 were 17,725,856 shares, the selling value being $13,997,166; an average of 78.96c. per share.

## STOCK QUOTATIONS

| NEW YORK | Jan. 7 |
|---|---|
| Name of Comp. | Clg. |
| Alaska Mine | ½ |
| Am.Nev.M.&P.Co. | .... |
| Amalgamated | 49¼ |
| Anaconda | 30¾ |
| Balaklala | 2¼ |
| British Col. Cop. | 4⅜ |
| Buffalo Cobalt | .... |
| Butte & London | .... |
| Butte Coalition | 16 |
| Butte Cop. & Zinc | .... |
| Cobalt Contact | .... |
| Colonial Silver | 1 |
| Cum. Ely Mining | 7 |
| Davis Daly | 4⅛ |
| Dominion Cop. | 1⅞ |
| El Rayo | 1¾ |
| Foster Cobalt | .63 |
| Furnace Creek | .30 |
| Giroux Mine | 3 |
| Gold Hill | 1⅛ |
| Granby, New | .... |
| Greene Gold | ⅞ |
| Greene G. & S | ½ |
| Greenw'r & D.Val. | .75 |
| Guanajuato | 2¼ |
| Guggen. Exp. | 135 |
| Hanapah | .35 |
| McKinley Dar. | 1⅞ |
| Micmac | 3⅝ |
| Mines Co. of Am. | 1⅝ |
| Mitchell Mining | ⅛ |
| Mont.Sho. C.(New) | 4¾ |
| Nev. Utah M. & S | 3⅝ |
| Newhouse M. & S. | 8½ |
| Nipissing Mines | 7¾ |
| Old Hundred | ¼ |
| Silver Queen | ⅛ |
| Stewart | ¼ |
| Tennessee Cop'r. | .... |
| Union Copper | ⅞ |
| Utah Apex | 2⅛ |
| West Columbus | .11 |

| N. Y. INDUSTRIAL | |
|---|---|
| Am. Agri. Chem. | .... |
| Am. Smelt. & Ref. | 73⅞ |
| Am. Sm. & Ref., pf. | 94⅞ |
| Bethlehem Steel | .... |
| Colo. Fuel & Iron | 19⅝ |
| Federal M. & S.,pf. | 67½ |
| Inter. Salt | 10 |
| National Lead | 40 |
| National Lead, pf. | .... |
| Pittsburg Coal | .... |
| Republic I. & S. | 16¼ |
| Republic I.& S.,pf. | 69 |
| Sloss-Sheffield | 38 |
| Standard Oil | 443 |
| Tenn. C. & I. | .... |
| U. S. Red. & Ref. | 7 |
| U. S. Steel | 26¾ |
| U. S. Steel, pf | 89⅜ |
| Va. Car. Chem. | 17½ |
| Va. I. Coal & Coke | 43 |

| ST. LOUIS | Jan. 4 | |
|---|---|---|
| N. of Com. | High. | Low. |
| Adams | .26 | .20 |
| Am. Nettie | .03 | .02 |
| Center Cr'k | 2.00 | 1.50 |
| Cent. C. & C. | 60.00 | 59.00 |
| C.C. & C. pd. | 74.00 | 70.00 |
| Cent. Oil | 90.00 | 80.00 |
| Columbia | 4.00 | 2.00 |
| Con. Coal | 26.00 | 23.00 |
| Doe Run | 120.00 | 110.00 |
| Gra. Bimet. | .25 | .20 |
| St. Joe | 13.00 | 12.00 |

| BOSTON | Jan. 7 |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 2½ |
| Allouez | 29⅞ |
| Am. Zinc | .... |
| Arcadian | 5 |
| Atlantic | 9⅞ |
| Bingham | 4½ |
| Boston Con | 13 |
| Calumet & Ariz. | 105 |
| Calumet & Hecla | 605 |
| Centennial | 26¾ |
| Con. Mercur | .... |
| Copper Range | 59 |
| Daly-West | 7⅜ |
| Franklin | 8 |
| Greene-Can. | 7⅜ |
| Isle Royal | 18¾ |
| La Salle | 13¾ |
| Mass | 3¾ |
| Michigan | 9⅞ |
| Mohawk | 50⅜ |
| Mont.C.&C. (new) | .... |
| Nevada | 9¼ |
| North Butte | 45¼ |
| Old Colony | .... |
| Old Dominion | 30 |
| Osceola | 88 |
| Parrot | 11 |
| Phoenix | .... |
| Quincy | 84 |
| Rhode Island | 3¾ |
| Santa Fe | 2¼ |
| Shannon | 11 |
| Tamarack | .... |
| Trinity | 15 |
| United Cop., com. | .... |
| U. S. Oil | 10¼ |
| U. S. Smg. & Ref. | 33¾ |
| U.S.Sm. & Re.,pd. | 38¾ |
| Utah Copper | 30¼ |
| Victoria | 4⅞ |
| Washington | .... |
| Winona | 4⅝ |
| Wolverine | .... |
| Wyandotte | .... |

*Ex. Div. †Ex. Rights.

| BOSTON CURB | |
|---|---|
| Ahmeek | 65 |
| Ariz. Com. | .... |
| Black Mt. | 4⅛ |
| East Butte | 5 |
| Hancock Con. | .... |
| Keweenaw | 4⅜ |
| Majestic | .95 |
| Raven | .89 |
| Shawmut | .40 |
| Superior | 15 |
| Superior & Pitts | 12¾ |
| Troy Man | .60 |

| LONDON | Jan. 8 | | |
|---|---|---|---|
| Name of Com. | Clg. | | |
| Dolores | £1 | 0s | 0d |
| Stratton'sInd. | 0 | 3 | 3 |
| Camp Bird | 0 | 13 | 3 |
| Esperanza | 1 | 9 | 0 |
| Tomboy | 1 | 7 | 6 |
| El Oro | 1 | 2 | 6 |
| Oroville | 0 | 13 | 0 |
| Somera | .. | .. | . |
| Utah Apex | .. | .. | . |
| Ariz. Cop.,pfd. | .. | .. | . |
| Ariz. Cop.,def. | .. | .. | . |

Cabled through Wm. P. Bonbright & Co., N.Y.

### NEVADA STOCKS. Jan. 8.
Furnished by Weir Bros. & Co., New York.

| Name of Comp. | Clg. | Name of Comp. | Clg. |
|---|---|---|---|
| TONOPAH STOCKS | | Golden Sceptre | ... |
| Belmont | .75 | Homestake King. | .70 |
| Extension | 1.40 | Montgomery Mt. | .05½ |
| Golden Anchor | .03 | Mont. Shoshone C. | 4.50 |
| Jim Butler | .40 | Original Bullfrog. | .03 |
| MacNamara | .17 | Tramp Cons | .18 |
| Midway | .54 | MANHAT'N STOCKS | |
| Montana | 1.80 | Manhattan Cons. | .25 |
| North Star | .10 | Manhat'n Dexter. | .11 |
| Tonopah & Cal. | ... | Jumping Jack | .05 |
| Tono'h Mine of N. | 4.50 | Stray Dog | .08 |
| West End Con | .31 | Indian Camp | .05 |
| GOLDFI'D STOCKS | | GREENW'R STOCKS | |
| Adams | .06 | Furnace Creek | ... |
| Atlanta | .31 | Greenwater &D.V. | ... |
| Blue Bell | .08 | Green'rCop.M.& S. | ... |
| Blue Bull | .17 | United Greenwa'r | ... |
| Booth | .17 | MISCELLANEOUS | |
| Columbia Mt. | .17 | Golden Boulder | .10 |
| Comb. Frac | .72 | Hayseed | .30 |
| Cracker Jack | .10 | Lee Gold Grotto | .10 |
| Dia'dfield B. B. C. | .20 | Nevada Hills | 3.00 |
| Goldfield Belmont | .13 | Nevada Smelting. | 1.62½ |
| Goldfield Con. | 4.68¾ | Pittsburgh S. Pk. | 1.50 |
| Goldfield Daisy | .91 | Round Mt. Sphinx | .30 |
| Goldfield Mining. | ... | | |
| Great Bend | .22 | | |
| Jumbo Extension | .61 | | |
| Jumbo Mining | ... | | |
| Katherine | .06 | | |
| Kendall | .11 | | |
| Laguna | ... | | |
| Lone Star | .09 | | |
| Lou Dillon | ... | | |
| May Queen | .05 | | |
| Mohawk | ... | | |
| Oro | .11 | | |
| Red Hill | .32 | | |
| Red Top | .. | | |
| Roanoke | .06 | | |
| Sandstorm | .22 | | |
| Silver Pick | .30 | | |
| St. Ives | .45 | | |
| Triangle | .08 | | |
| BULLFROG STOCKS | | | |
| Amethyst | ... | | |
| Bullfrog Daisy | ... | | |
| Bullfrog Mining | .06 | | |
| Bullfrog Nat. B. | .10 | | |
| Gibraltar | .10 | | |
| Gold Bar | .38 | | |

| COLO. SPRINGS | Jan. 4 |
|---|---|
| Name of Comp. | Clg. |
| Acacia | 6 |
| Black Bell | .... |
| C. C. Con | 4 |
| Dante | 8 |
| Doctor Jack Pot | .... |
| Elkton | 48 |
| El Paso | 26½ |
| Findlay | 39 |
| Gold Dollar | .... |
| Gold Sovereign | 33¾ |
| Isabella | 26½ |
| Index | .... |
| Jennie Sample | .... |
| Jerry Johnson | 6 |
| Mary McKinney | .... |
| Pharmacist | .... |
| Portland | 1.00 |
| Un. Gold Mines | 5 |
| Vindicator | .... |
| Work | 14½ |

### New Dividends

| Company. | Payable. | Rate. | Amt. |
|---|---|---|---|
| Am. Cement | Jan. 23 | $0.30 | $60,000 |
| Am. Sm'g & Ref. Co., com. | Jan. 15 | 2.00 | 1,000,000 |
| Am. Sm'g & Ref. Co., pfd. | Jan. 2 | 1.75 | 875,000 |
| Anaconda | Jan. 15 | 0.50 | 600,000 |
| Cent. C. & C., com | Jan. 15 | 1.50 | 76,875 |
| Cent. C. & C., pfd | Jan. 15 | 1.25 | 23,438 |
| Doe Run | Jan. 15 | 0.50 | 29,531 |
| Empire Steel, pfd | Jan. 1 | 3.00 | 75,000 |
| Gen. Chemical, pfd | Jan. 2 | 1.50 | 150,000 |
| Georges Creek C. & I. | Jan. 22 | 2.50 | 55,000 |
| Kerr Lake | Jan. 31 | 0.15 | 90,000 |
| Maryland Coal | Jan. 15 | 4.00 | 75,400 |
| McKinley Darragh | Jan. 15 | 0.04 | 80,000 |
| Monon Con. C. & C., pfd | Jan. 25 | 3.50 | 350,000 |
| Montezuma M. & S. | Jan. 10 | 0.04 | 40,000 |
| New Idria | Jan. 1 | 0.02 | 20,000 |
| Nipissing | Jan. 21 | 0.15 | 180,000 |
| Pocahontas Con., pfd | Jan. 1 | 3.00 | 84,000 |
| Sloss. Sheff., pfd | Jan. 2 | 1.75 | 117,250 |
| United Metals Selling | Jan. | 7.50 | 375,000 |
| U. S. Smelting, com | Jan. 15 | 0.50 | 233,715 |
| U. S. Smelting, pfd | Jan. 15 | 0.87½ | 304,646 |
| United Verde | Dec. | 0.75 | 225,000 |
| Utah Con | Jan. 15 | 0.50 | 450,000 |
| Va. Car. Chem., pfd | Jan. 15 | 2.00 | 360,000 |

### Assessments

| Company. | Delinq. | Sale. | Amt. |
|---|---|---|---|
| Crown Point, Nev. | Nov. 26 | Dec. 19 | $0.10 |
| Del Monte, Cal. | Nov. 20 | Dec. 11 | 10.00 |
| Emerald, Utah | Dec. 14 | Jan. 11 | 0.01 |
| Etna-King, Cal. | Dec. 14 | Jan. 6 | 0.03 |
| Hale & Norcross, N. | Dec. 6 | Dec. 23 | 0.10 |
| New Stockton, Utah | Dec. 23 | Jan. 20 | 0.02½ |
| Pacific Tin M. Al'ka | Nov. 30 | Dec. 20 | 0.02 |
| Pittsburg C., Utah. | Dec. 2 | Dec. 23 | 0.01 |
| Posey Canyon, Utah | Dec. 6 | Dec. 23 | 0.01 |
| Progressive, Utah | Dec. 16 | Jan. 6 | 0.01 |
| ProvidentOilMg.,Ca. | Dec. 7 | Dec. 27 | 0.01¼ |
| Rescue, Nev | Dec. 10 | Jan. 3 | 0.02 |
| Savage, Nev. | Jan. 8 | Jan. 30 | 0.10 |
| Scottish Chief, Utah | Dec. 9 | Dec. 28 | 0.01 |
| Sierra Nevada, Nev. | Dec. 30 | Jan. 20 | 0.10 |
| Silver Queen, Utah. | Dec. 7 | Dec. 24 | 0.01½ |
| Surprise, Ida. | Dec. 11 | Jan. 6 | 0.01½ |
| Ultimo, Cal. | Dec. 2 | Dec. 23 | 0.05 |
| Wabash, Utah | Nov. 30 | Dec. 23 | 0.03 |
| West End, Utah. | Nov. 3 | Dec. 31 | 0.01½ |
| Yellow Jacket, Nev. | Dec. 18 | Jan. 23 | 0.25 |

## Monthly Average Prices of Metals

### AVERAGE PRICE OF SILVER

| Month. | New York. | | London. | |
|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. |
| January | 65.288 | 68.673 | 30.113 | 31.769 |
| February | 66.108 | 68.835 | 30.464 | 31.852 |
| March | 64.597 | 67.519 | 29.854 | 31.325 |
| April | 64.765 | 65.462 | 29.984 | 30.253 |
| May | 66.976 | 65.981 | 30.968 | 30.471 |
| June | 65.394 | 67.090 | 30.185 | 30.893 |
| July | 65.105 | 68.144 | 30.113 | 31.366 |
| August | 65.949 | 68.745 | 30.529 | 31.637 |
| September | 67.927 | 67.792 | 31.483 | 31.313 |
| October | 69.523 | 62.435 | 32.148 | 28.863 |
| November | 70.813 | 58.677 | 32.671 | 27.154 |
| December | 69.050 | 54.565 | 32.003 | 25.362 |
| Year | 66.791 | 65.327 | 30.868 | 30.188 |

New York, cents per fine ounce; London, pence per standard ounce.

### AVERAGE PRICES OF COPPER

| | NEW YORK. | | | | LONDON. | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake. | | | |
| | 1906. | 1907. | 1906. | 1907. | 1906. | 1907. |
| January | 18.310 | 24.404 | 18.419 | 24.825 | 78.869 | 106.739 |
| February | 17.869 | 24.869 | 18.116 | 25.236 | 78.147 | 107.356 |
| March | 18.361 | 25.065 | 18.641 | 25.560 | 81.111 | 106.594 |
| April | 18.375 | 24.224 | 18.688 | 25.260 | 84.793 | 98.625 |
| May | 18.475 | 24.048 | 18.724 | 25.072 | 84.867 | 102.375 |
| June | 18.442 | 22.665 | 18.719 | 24.140 | 83.994 | 97.272 |
| July | 18.190 | 21.130 | 18.585 | 21.923 | 81.167 | 95.016 |
| August | 18.380 | 18.356 | 18.706 | 19.255 | 83.864 | 79.679 |
| September | 19.033 | 15.565 | 19.328 | 16.047 | 87.831 | 68.375 |
| October | 21.203 | 13.169 | 21.722 | 13.551 | 97.269 | 60.717 |
| November | 21.833 | 13.391 | 22.398 | 13.870 | 100.270 | 61.226 |
| December | 22.885 | 13.163 | 23.350 | 13.393 | 105.226 | 60.113 |
| Year | 19.278 | 20.004 | 19.616 | 20.661 | 87.282 | 87.007 |

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

### AVERAGE PRICE OF TIN AT NEW YORK

| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
|---|---|---|---|---|---|
| January | 36.390 | 41.548 | July | 37.275 | 41.091 |
| February | 36.403 | 42.102 | August | 40.606 | 37.667 |
| March | 36.662 | 41.313 | September | 40.516 | 36.689 |
| April | 38.900 | 40.938 | October | 42.852 | 32.620 |
| May | 43.313 | 43.149 | November | 42.906 | 30.833 |
| June | 39.260 | 42.120 | December | 42.750 | 27.925 |
| | | | Av. year | 39.819 | 38.166 |

Prices are in cents per pound.

### AVERAGE PRICE OF LEAD

| Month. | New York. | | London. | |
|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. |
| January | 5.600 | 6.000 | 16.850 | 19.828 |
| February | 5.464 | 6.000 | 16.031 | 19.531 |
| March | 5.350 | 6.000 | 15.922 | 19.703 |
| April | 5.404 | 6.000 | 15.959 | 19.975 |
| May | 5.685 | 6.000 | 16.725 | 19.688 |
| June | 5.750 | 5.760 | 16.813 | 20.188 |
| July | 5.750 | 5.288 | 16.525 | 20.350 |
| August | 5.750 | 5.250 | 17.109 | 19.063 |
| September | 5.750 | 4.813 | 18.266 | 19.775 |
| October | 5.750 | 4.750 | 19.350 | 18.531 |
| November | 5.750 | 4.376 | 19.281 | 17.281 |
| December | 5.900 | 3.658 | 19.609 | 14.500 |
| Year | 5.657 | 5.325 | 17.370 | 19.034 |

New York, cents per pound. London, pounds sterling per long ton.

### AVERAGE PRICE OF SPELTER

| MONTH. | New York. | | St. Louis. | | London. | |
|---|---|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. | 1906. | 1907. |
| January | 6.487 | 6.732 | 6.337 | 6.582 | 28.225 | 27.125 |
| February | 6.075 | 6.814 | 5.924 | 6.664 | 25.844 | 25.938 |
| March | 6.209 | 6.837 | 6.056 | 6.687 | 24.563 | 26.094 |
| April | 6.087 | 6.685 | 5.931 | 6.535 | 25.781 | 25.900 |
| May | 5.997 | 6.441 | 5.846 | 6.291 | 27.000 | 25.563 |
| June | 6.096 | 6.419 | 5.948 | 6.269 | 27.728 | 25.469 |
| July | 6.006 | 6.072 | 5.856 | 5.922 | 26.800 | 23.850 |
| August | 6.027 | 5.701 | 5.878 | 5.551 | 26.938 | 21.969 |
| September | 6.216 | 5.236 | 6.056 | 5.086 | 27.563 | 21.050 |
| October | 6.222 | 5.430 | 6.070 | 5.280 | 28.075 | 21.781 |
| November | 6.375 | 4.925 | 6.225 | 4.775 | 27.781 | 21.438 |
| December | 6.593 | 4.254 | 6.443 | 4.104 | 27.938 | 20.075 |
| Year | 6.198 | 5.962 | 6.048 | 5.812 | 27.020 | 23.771 |

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

# CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

| | | |
|---|---|---|
| **ABRASIVES—** | | |
| Bort, good drill quality, carat | | $85.00 |
| Carborundum, f.o.b. Niagara Falls, powd | lb. | .06 |
| Grains | " | .10@.17 |
| Corundun | " | .07@.10 |
| Crushed Steel, f.o.b. Pittsburg | " | .05¾@.06 |
| Emery, in kegs: Turkish flour | " | .01½@.02½ |
| Grains | " | .03½@.04½ |
| Naxos flour | " | .01½@.02½ |
| Grains | " | .03½@.04½ |
| Chester flour | " | .01½ |
| Grains | " | .03½@.04½ |
| Peekskill, f.o.b. Easton, Pa., flour | " | .01½@.01½ |
| Grains, in kegs | " | .02½@.02½ |
| Garnet, per quality | sh. ton | 25.00@35.00 |
| Pumicestone, Am. Powd. 100 | lb. | 1.60@2.00 |
| Italian, powdered | " | .01¼@.01½ |
| Lump, per quality | " | .03@.20 |
| Rottenstone, ground | " | .02½@.04½ |
| Lump, per quality | " | .05@.25 |
| Rouge, per quality | " | .05@.30 |
| Steel Emery, f.o.b. Pittsburg | " | .07½@.07¾ |
| **ACIDS—** | | |
| Acetic 28% | lb. | .026@.03 |
| Boric | " | .09¾@.10 |
| Hydrofluoric, 30% | " | .02¾@.03 |
| " 48% | " | .06 |
| " 60% | " | .10 |
| Hydrochloric acid, 20°, per lb | | 1.25@1.50 |
| Nitric acid, 38° | per lb. | 4.25@4.62½c. |
| Sulphuric acid, 50°, bulk, per ton | | $12 up. |
| 60°, 100 lb. in carboys | | .85@1.12½ |
| 60°, bulk, ton | | 16.00@18.00 |
| 66°, 100 lb. in carboys | | 1.00@1.25 |
| 66°, bulk, ton | | 18.00 |
| Oxalic | " | .08¼@.08½ |
| **ALCOHOL**—Grain | gal. | 2.46½ |
| Refined wood, 95@97% | " | .70@.75 |
| **ALUM**—Lump | 100 lb. | $1.75 |
| Ground | " | 1.85 |
| Chrome Alum | lb. | .05¾@.06 |
| **ALUMINUM**—Sulphate, com'l. | " | 1.25@1.75 |
| **AMMONIA**—24 deg. | lb. | .04¼@.05¼ |
| " 26 " | " | .04¾@.05¾ |
| **AMMONIUM—** | | |
| Bromide | lb. | .23 |
| Carbonate | " | .07¾@.08 |
| Muriate grain | " | .05¾@.06¼ |
| Lump | " | .09½@.09½ |
| Sulphate, 100 lb | | 3.05@3.10 |
| Sulphocyanide com | " | .30 |
| " " chem. pure | " | .40 |
| **ANTIMONY**—needle, lump | lb. | .05½@ 06½ |
| **ARSENIC**—White | " | .05¾@.06 |
| Red | " | .07½@.07¾ |
| **ASPHALTUM—** | | |
| Barbadoes | per ton. | 40.00@80.00 |
| West Indies | " | 20.00@60.00 |
| Egyptian | lb. | .12@.14 |
| Gilsonite, Utah ordinary | per ton. | 35.00 |
| Trinidad | " | 28.00@30.00 |
| California | " | 21.00@27.00 |
| **BARIUM—** | | |
| Carb. Lump, 80@90% | lg. ton. | 30.00@35.00 |
| Precipitated 96@98% | | 31.50@35.00 |
| Powdered, 80@90% | lb. | .02@.02½ |
| Chloride com'l | ton. | 38.00@40.00 |
| Nitrate, powdered, in casks | lb. | .05½@.06 |
| Blanc Fixe | per lb. | .02¼ |
| **BARYTES—** | | |
| Am. Ground | sh. ton. | 14.00@21.00 |
| Floated | " | 22.00 |
| Foreign floated | " | 19.50@22.50 |
| **BISMUTH**—Sub-nitrate | lb. | 1.50 |
| **BLEACHING POWDER**—35%, 100 | lb. | 1.25@1.40 |
| **BLUE VITRIOL**—(copper sulphate), carload, per 100 | lb. | 5.50 |
| **BONE ASH** | lb. | .02½@.04 |
| **BORAX** | " | .07½@.08 |
| **CALCIUM**—Acetate, gray | " | 2.50@2.55 |
| Acetate, brown | " | 1.60@1.65 |
| Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. | sh. ton. | 65.00 |
| Chloride, f.o.b. N. Y. | " | 14.75@19.75 |
| **CEMENT—** | | |
| Portland, Am. 500 lb. | bbl. | 1.55@1.60 |
| Foreign | " | 2.25@2.90 |
| "Rosendale," 300 lb. | " | .85 |
| (in sacks) | | .65 |
| Slag cement | " | .75@1.25 |
| **CHROME ORE—** | | |
| New Caledonia 50% ex. ship N. Y. | per lg. ton | 17.50@20.00 |
| Bricks, f.o.b. Pittsburg, M. | " | 175.00 |
| **CLAY, CHINA**—Am. common ex-dock, N. Y. | " | 8.50@9.00 |
| Foreign | " | 10.00@17.50 |
| **COBALT**—Oxide | lb. | 2.50 |
| **COPPERAS**—Bulk | 100 lb. | $0.55 |
| In bbls | " | .65@.75 |
| In bags | " | .60@.70 |
| **CRYOLITE** | lb. | .06½@.06¾ |
| **FELDSPAR**—Ground best | sh. ton. | 10.50@15.00 |
| **FIRE BRICK—** | | |
| American | per M. | 30.00@40.00 |
| Imported | " | 30.00@45.00 |
| St. Louis No. 1 | " | 18.00 |
| " No. 2 | " | 15.00 |
| Extra | " | 20.00@23.00 |
| **FIRE CLAY**—F. o. b. St. Louis. | | |
| St. Louis, extra quality | per ton | 5.00 |
| " ordinary | " | 2.50 |
| **FLUORSPAR—** | | |
| Domestic f.o.b. shipping port: | | |
| Lump | lg. ton. | 8.00@10.00 |
| Ground | " | 11.50@13.50 |
| Foreign crude ex. dock | | 8.00@10.00 |
| **FULLER'S EARTH**—Lump, 100 | lb. | .75@.85 |
| Powdered | " | .75@.85 |
| **GRAPHITE**—Ceylon | | |
| Flying dust, finest to best | lb. | .01@.04 |
| Dust | " | .01¾@.05 |
| Chip | " | .02¾@.07½ |
| Lump | " | .04@ 10 |
| Large lump | " | .07@.10 |
| **GYPSUM—** | | |
| Fertilizer | sh. ton. | 7.00 |
| Powdered | sh. ton. | 12.00@20.00 |
| **INFUSORIAL EARTH—** | | |
| Ground Am. best | lb. | .01¾ |
| French | lg. ton. | 55.00 |
| German | lb. | .02½@.02⅝ |
| **LEAD**—Acetate (sugar of) brown | lb. | .07¾ |
| Nitrate, com'l | " | .09@.09¼ |
| **MAGNESITE**—Greece. | | |
| Crude (95%) | lg. ton. | 8.00@10.00 |
| Calcined, powdered | sh. ton. | 30.00@40.00 |
| Bricks, domes, per qual. f.o.b. Pittsburg | M. | 160@200 |
| **MAGNESIUM—** | | |
| Chloride, com'l | 100 lb. | .80@1.00 |
| Sulphate (Epsom salt) | 100 lb. | .90@1.00 |
| **MANGANESE—** | | |
| Foreign, crude, powdered: | | |
| 70@75% binoxide | lb. | .01@.01¼ |
| 75@85% binoxide | " | .01¼@.01¾ |
| 85@90% binoxide | " | .01¾@.05 |
| 90@95% binoxide | " | .06¼ |
| Ore, 80%-85% | sh. ton. | 20.00@50.00 |
| **MARBLE**—Flour | sh. ton. | 9.50@10.00 |
| **MINERAL WOOL—** | | |
| Slag, ordinary | " | 19.00 |
| Selected | " | 25.00 |
| Rock, ordinary | " | 32.00 |
| Selected | " | 40.00 |
| **MONAZITE SAND—** | | |
| Guar. 97%, with 5% Thorium oxide, nominal | lb. | .08 and up. |
| **NICKEL—** | | |
| Oxide, crude, lb. (77%) for fine metal contained | | .47 |
| Sulphate, single | lb. | .09@.11 |
| " double | " | .06½@.08 |
| **NITRATE OF SODA**—100 lb. 95% for '07 | | 2.45 |
| 95% for 1908 | | 2.45@2.50 |
| 95% for 1909 | | 2.40 |
| 96% is 5c higher per 100 lb. | | |
| **OZOKERITE**—best | lb. | .14@.17 |
| **PAINTS AND COLORS—** | | |
| Litharge, Am. powdered | " | .06½@.06¾ |
| English glassmakers' | " | .06½@.06¾ |
| Lithopone | " | .03½@.07 |
| Metallic, brown | sh. ton. | 16.50@22.00 |
| Red | " | 14.00@18.00 |
| Ocher, Am. common | " | 8.50@9.00 |
| Best | " | 16.00 |
| Dutch, washed | lb. | .02½@.03 |
| French, washed | " | .01½@.02½ |
| Paris green, pure, bulk | " | .26 |
| Red lead, American | " | .06½@.06¾ |
| Foreign | " | .06½@.06½ |
| Turpentine, spirits bbl., per gal. | | .44½@.45 |
| White lead, Am., dry | lb. | .06½@.06 |
| American, in oil | " | .06½@.06¾ |
| Foreign, in oil | " | .10¼@.10½ |
| Zinc white, Am. extra dry | " | .05½@.05¾ |
| French, red seal, dry | " | .08½@.08¾ |
| " Green seal, dry | " | .10½@.10¾ |
| **PHOSPHATES**—Acid | 70@75c per unit | |
| *Fla., hard rock | | 10.25@10.50 |
| land pebble 68% | | 7.50@7.75 |
| †Tenn., 78@80% | | 6.50@7.00 |
| 75% | | 6.00@6.25 |
| 68@72% | | 4.00@4.25 |
| ‡So. Car. land rock | | 6.75@7.00 |
| " " river rock | | 7.00@7.25 |
| **POTTASSIUM—** | | |
| Bicarbonate crystal | lb. | $.08½@.09 |
| Powdered or granulated | " | .09@.09½ |
| Bichromate, Am | " | .08½@.09 |
| Scotch | " | .11 |
| Bromide | " | .15@.17 |
| Carbonate (80@85%) | " | .03½@.04 |
| Caustic, ordinary | " | .04½@0.5½ |
| Elect. (90%) | " | .05½@.06 |
| Chloride (muriate), 100 lb. | | 1.90 |
| Chlorate, powdered | " | .09½@.09¾ |
| Crystals | " | 09@09½ |
| Cyanide (98@99%) | | |
| Carloads (30,000 lb.) | " | 18c. |
| 5-ton lots | " | 18½c. |
| Less than 5 tons | " | 19c. |
| Kainite, long ton, bulk, 8.50; bags, 9.50. | | |
| Permanganate | lb. | .09½@.10 |
| Prussiate, yellow | " | .15½@.16 |
| Red | " | .33@.38 |
| Sulphate | 100 lb. | 2.18½@2.21½ |
| **PYRITE—** | | |
| Domestic, non-arsenical, furnace size, f.o.b. mines | per unit | 11@11½c. |
| Domestic, non-arsenical, fines, per unit, f.o.b. mines | | 10@10½c. |
| Imported non-arsenical, furnace size, per unit | | .13@.13½ |
| Imported, arsenical, furnace size, per unit | | .12@.13 |
| Imported fines, arsenical, per unit | | .08½@.09 |
| " " non-arsenical, per unit | | 10½@11c. |

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

| | | |
|---|---|---|
| **SALT**—N. Y. com. fine 280 lb. | bbl. | .72@1.18 |
| N. Y. agricultural | sh. ton. | 3.80@4.50 |
| **SALTPETER**—Crude | 100 lb. | 4.50@5.00 |
| Refined, crystals | " | 5.25@5.75 |
| **SILICA—** | | |
| Ground quartz, ord'ry | lg. ton | 13.00@15.00 |
| Silex | " | 13.00@40.00 |
| Lump Quartz | " | 5.00@6.00 |
| Glass sand | " | 2.75 |
| **SILVER**—Nitrate, crystals | oz. | .40@.42 |
| **SODIUM—** | | |
| Acetate | lb. | .04¼@.04½ |
| "Alkali," per 100 lb., 58/48 | | .80@.87½ |
| Bicarb. soda, per 100 lb | | 1.20@1.50c. |
| Soda, caustic, per 100 lb., 76/60 | | 1.75@1.85 |
| " " powdered | | .02¾@.03½ |
| Salt cake, per 100 lb | | .55@.70 |
| Soda, monohydrate, per lb | | 1.4@1.75c. |
| Bichromate | lb. | .07½@.07¾ |
| Bromide | " | .15@.17 |
| Chlorate, com'l | " | .09@.09½ |
| Cyanide ("100% KCN") | | |
| Carloads (30,000 lb.) | " | 18c. |
| 5-ton lots | " | 18½c. |
| Less than 5 tons | " | 19c. |
| Hyposulphite, Am | " | 1.35 up |
| German | " | 1.60@1.70 |
| Phosphate | 100 lb. | 2.10@2.30 |
| Prussiate | " | .09½@.10 |
| Sal soda, f.o.b. N. Y | 100 lb. | .65@.70 |
| Foreign, f.o.b. N. Y. | " | .80@1.00 |
| Silicate, com'l | 100 lb. | .80@1.15 |
| Sulphate, com'l, (Glauber's salt) | 100 lb. | .50@.70 |
| " " calcined | | .65@.85 |
| **STRONTIUM**—Nitrate | lb. | .08@.08½ |
| **SULPHUR—** | | |
| Louisiana (prime) to New York, Boston or Portland | lg. ton | 19.50 |
| To Philadelphia or Baltimore | " | 19.50 |
| Roll | 100 lb. | 1.85@2.15 |
| Flour | " " | 2.00@2.40 |
| Flowers, sublimed | " " | 2.20@2.60 |
| **TERRA ALBA**—French & Eng. | 100 lb. | .75@1.00 |
| **TALC**—Domestic | sh. ton. | 15.00@25.00 |
| French | " | 16.00@25.00 |
| Italian, best | " | 35.00@40.00 |
| **TIN**—Bi-chloride, 50% | lb. | .08½@ 08¾ |
| Crystals | " | .19¼ up |
| Oxide, lb | | .37@.39 |
| **URANIUM**—Oxide | " | 3.50 |
| **ZINC—** | | |
| Chloride solution, com'l 20° | " | .02½ |
| Chloride, granular | " | .04½@.05 |
| Dust | " | .05½@.06 |
| Sulphate | " | .02½@.02½ |

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

## Metal and Mining Companies—U. S.

| Name of Company and Location. | | Author-ized Capital | Shares. Issued. | Par Val. | Dividends. Total to Date. | Latest. Date. | Amt. |
|---|---|---|---|---|---|---|---|
| Alaska Mexican, g. | Al'ka | $1,000,000 | 180,000 | $ 5 | $1,716,381 | Oct. 1907 | $ .50 |
| Alaska Treadwell,g. | Al'ka | 5,000,000 | 200,000 | 25 | 9,635,000 | Oct. 1907 | 1.00 |
| Alaska United, g. | Al'ka | 1,000,000 | 180,200 | 5 | 306,340 | Jan. 1907 | 0.30 |
| Amalgamated, c,. | Mont | 155,000,000 | 1,530,879 | 100 | 55,177,425 | Nov. 1907 | 1.00 |
| Am.Sm.&Ref.,com. | U. S. | 50,000,000 | 500,000 | 100 | 12,625,000 | Jan. 1908 | 2.00 |
| Am. Sm. & Ref. pf. | U. S. | 50,000,000 | 500,000 | 100 | 26,213,053 | Jan. 1908 | 1.75 |
| Am. Smelters, pf. A | U. S. | 17,000,000 | 170,000 | 100 | 2,195,000 | Dec. 1907 | 1.50 |
| Am. Smelters. pf. B | U. S. | 30,000,000 | 300,000 | 100 | 3,750,000 | Dec. 1907 | 1.25 |
| Am.Zinc,Lead&Sm. | Kan. | 3,750,000 | 80,000 | 25 | 100,000 | Nov. 1907 | .50 |
| Anaconda,c. | Mont | 30,000,000 | 1,200,000 | 25 | 39,050,000 | Jan. 1908 | .50 |
| Arizona, c. | Ariz | 3,775,000 | 3,682,520 | ..... | 6,182,361 | Apr. 1906 | .05 |
| Atlantic, c | Mich | 2,500,000 | 100,000 | 25 | 990,000 | Feb. 1905 | .02 |
| Bald Butte, g. s. | Mont | 250,000 | 250,000 | 1 | 1,354,648 | Oct. 1907 | .04 |
| Beck Tunnel, g.s.l. | Utah | 100,000 | 1,000,000 | 0.10 | 615,000 | Oct. 1907 | .02 |
| Bingham & N.H.,c.g | Utah | 2,000,000 | 226,000 | 5 | 22,600 | Sept. 1906 | .10 |
| Boston & Montana. | Mont | 3,750,000 | 150,000 | 25 | 48,775,000 | Nov. 1907 | 6.00 |
| Bull.Beck.&Cham.g | Utah | 1,000,000 | 100,000 | 10 | 2,688,400 | Apr. 1907 | .10 |
| Bunker Hill & Sull. | Ida | 3,000,000 | 300,000 | 10 | 9,816,000 | Dec. 1907 | .30 |
| Butte Coalition,c.s. | Mont | 15,000,000 | 1,000,000 | 15 | 2,450,000 | Dec. 1907 | .15 |
| Calumet & Arizonac | Ariz | 2,500,000 | 200,000 | 10 | 9,300,000 | Dec. 1907 | 1.50 |
| Calumet & Hecla,c. | Mich | 2,500,000 | 100,000 | 25 | 105,900,000 | Dec. 1907 | 10.00 |
| Camp Bird, g., s. | Colo | 5,500,000 | 820,000 | 5 | 4,276,300 | Nov. 1907 | .24 |
| Carisa, c.g. | Utah | 500,000 | 500,000 | 1 | 55,000 | Nov. 1906 | .01 |
| Central Eureka, g. | Cal | 400,000 | 398,425 | 1 | 778,921 | Mar. 1906 | .07 |
| Columbus Con. c. | Utah | 1,500,000 | 283,540 | 5 | 226,832 | Oct. 1907 | .20 |
| Combi'tion Co.G'f'd | Nevada | 400,000 | 320,000 | 1 | 688,000 | Sept. 1906 | .15 |
| Con. Mercur, g. | Utah | 1,000,000 | 1,000,000 | 1 | 1,205,000 | Dec. 1906 | .02½ |
| Continental, z. l. | Mo | 550,000 | 22,000 | 25 | 220,000 | Oct. 1907 | .50 |
| Copper Range Con. | Mich | 38,500,000 | 383,781 | 100 | 6,477,801 | Jan. 1908 | 1.00 |
| Creede United, g. | Colo | 2,000,000 | 1,625,000 | 1 | 214 053 | July 1906 | .00½ |
| Cripple Creek Con.g | Colo | 2,000,000 | 2,000,000 | 1 | 180,000 | Mar. 1905 | .00½ |
| Daly Judge, g. s. l. | Utah | 300,000 | 300,000 | 1 | 225,000 | Apr. 1907 | .37½ |
| Daly West, g. s. l. | Utah | 3,600,000 | 180,000 | 20 | 5,877,000 | Dec. 1907 | .30 |
| De Lamar, g. s. | Ida | 400,000 | 67,180 | 5 | 2,926,370 | May 1905 | .72 |
| Dillon, g. | Colo | 1,250,000 | 1,250,000 | 1 | 21,875 | July 1905 | .01 |
| Doctor Jack Pot. | Colo | 3,000,000 | 3,000,000 | 1 | 268,000 | July 1906 | .00½ |
| Doe Run, l. | Mo | 10,000,000 | 59,062 | 100 | 1,523,630 | Jan. 1908 | .50 |
| Elkton Con., g. | Colo | 3,000,000 | 2,500,000 | 1 | 1,879,460 | June 1907 | .01½ |
| El Paso, g. | Colo | 2,500,000 | 2,450,000 | 1 | 1,022,750 | June 1906 | .01 |
| Fed. Sm., com. | Idaho | 10,000,000 | 60,000 | 100 | 2,618,750 | Dec. 1907 | 1.50 |
| Federal Sm., pf. | Idaho | 20,000,000 | 120,000 | 100 | 3,281,250 | Dec. 1907 | 1.75 |
| Findley, g. | Colo | 1,250,000 | 1,250,000 | 1 | 325,000 | Aug. 1906 | .01 |
| Frances-Mohawk,g | Nevada | 1,000,000 | 910,000 | 1 | 323,000 | July 1907 | 0.10 |
| Gemini-Keystone | Utah | 500,000 | 5,000 | 100 | 1,950.000 | July 1907 | 10.00 |
| Gold King Con | Colo | 5,750,370 | 5,750,370 | 1 | 1.407.504 | May 1905 | .01 |
| Goldfield Con., g. | Nevada | 50,000,000 | 5,000,000 | 10 | 1,000,000 | Nov. 1907 | .10 |
| Grand Central, g. | Utah | 250,000 | 250,000 | 1 | 1,333,000 | Oct. 1907 | .05 |
| Gwin Mine, Dev., g. | Cal | 1,000,000 | 100,000 | 10 | 35,000 | Mar. 1906 | .25 |
| Hecla, s. l. | Idaho | 250,000 | 1,000,000 | 0.25 | 1,460,000 | Dec. 1907 | .02 |
| Homestake, g. | S. D. | 21,840,000 | 218,400 | 100 | 22,244,040 | Apr. 1907 | .50 |
| HornSilver,g.s.c.z.l | Utah | 10,000,000 | 400,000 | 25 | 5,642,000 | Sept. 1907 | .05 |
| Inter'l Nickel, pf. | N. Y. | 12,000,000 | 87,415 | 100 | 1,048,992 | Feb. 1908 | 1.50 |
| Iron Silver | Colo | 10,000,000 | 500,000 | 20 | 4,100,000 | Oct. 1907 | .10 |
| Jamison, g. | Cal | 3,900 000 | 390,000 | 10 | 286,270 | Oct. 1907 | .02 |
| Jerry Johnson. | Cal | 2,500,000 | 2,500,000 | 1 | 61,700 | Apr. 1906 | .03 |
| Kendall, g. | Mont | 2,500,000 | 500 000 | 5 | 1,130,000 | Aug. 1907 | .02 |
| Liberty Bell,g. s. | Colo | 700,000 | 130,551 | 5 | 110,857 | Jan. 1906 | .15 |
| Lightner, g. | Cal | 125,000 | 102,255 | 1 | 295,694 | Aug. 1905 | .05 |
| Lower Mammoth, g | Utah | 190,000 | 190,000 | 1 | 42,750 | Aug. 1907 | .07½ |
| Mammoth, g. s. l. | Utah | 10,000 000 | 400,000 | 2.50 | 2,140,000 | Dec. 1907 | .05 |
| Mary McKinney, g. | Colo | 1,500,000 | 1,304,252 | 1 | 801,765 | Apr. 1907 | .03 |
| May Day, g. s. l. | Utah | 800,000 | 800,000 | 1 | 70,010 | Oct. 1907 | .01½ |
| Mohawk, c. | Mich | 2,500,000 | 100,000 | 25 | 1,400,000 | July 1907 | 5.00 |
| Mont. Ore Purch. | Mont | 2,500,000 | 80,833 | 25 | 9.437.274 | Jan. 1907 | 15.00 |
| Nevada Hills, s.g. | Nevada | 1,000,000 | 200,000 | 5 | 300,000 | Sept. 1907 | .10 |
| New Century, z., l. | Mo. | 300,000 | 300,000 | 1 | 230,300 | Aug. 1907 | .00½ |
| Newhouse M. & S.c. | Utah | 6,000,000 | 600,000 | 10 | 600,000 | Nov. 1907 | .50 |
| New Idria, q. | Cal | 500,000 | 100,000 | 5 | 960,000 | Jan. 1908 | .20 |
| New Jersey Zinc | U. S. | 10,000,000 | 100,000 | 100 | 8,400,000 | Feb. 1906 | 3.00 |
| North Butte | Mont | 6,000,000 | 400,000 | 15 | 5,800,000 | Sept. 1907 | 2.00 |
| North Star, g. | Cal | 2,500,000 | 250,000 | 10 | 1,636,989 | Dec. 1907 | .20 |
| Old Dominion Cop. | Ariz | 7,500,000 | 281,589 | 25 | 280,843 | May 1906 | .50 |
| Old Gold | Colo | 2,101,150 | 2,101,150 | 1 | 10,506 | Mar. 1906 | .05 |
| Ophir, g. s. | Nevada | 302,400 | 100,800 | 3 | 1,797,400 | July 1904 | .25 |
| Osceola, c. | Mich | 2,500,000 | 96,150 | 25 | 7.035 650 | July 1907 | 7.00 |
| Parrot, c,s. | Mont | 2,300,000 | 229,850 | 10 | 6,807,649 | Sept. 1907 | .25 |
| Pennsylvania, g. | Cal | 5,150,000 | 51,500 | 100 | 284,925 | July 1905 | .10 |
| Pitts. L. & Z., l.z. | Mo | 1,000,000 | 1,000,000 | 1 | 20,000 | July 1907 | .02 |
| Portland, g. | Colo | 3,000,000 | 3,000,000 | 1 | 7,627,080 | Oct. 1907 | .04 |
| Quartette, g. s. | Nevada | 1,000,000 | 100 000 | 10 | 375,000 | July 1907 | .20 |
| Quincy. c | Mich | 3,750,000 | 110,000 | 25 | 17,945.446 | Dec. 1907 | 2.00 |
| Rocco Homest'k,l.s. | Nevada | 300,000 | 300,000 | 1 | 112 000 | Dec. 1905 | .02 |
| Sacramento, g, q. | Utah | 1,000,000 | 1,000,000 | 1 | 258,000 | Nov. 1906 | .00½ |
| St. Joseph, l. | Mo | 20,000,000 | 1,000 000 | 10 | 5,558,357 | Dec. 1907 | .15 |
| Silver Hill, g. s. | Nevada | 108,000 | 108 000 | 1 | 81 000 | June 1907 | .05 |
| Silver King, g. s. l† | Utah | 3.000,000 | 150,000 | 20 | 11,187,500 | July 1907 | .33½ |
| Silver King Co't'n.† | Utah | 6,250,000 | 1,250,000 | 5 | 187,500 | Oct. 1907 | .15 |
| Shannon, c. | Ariz | 3,000,000 | 300,000 | 10 | 450 000 | July 1907 | .50 |
| Snowstorm, s. l. | Ida | 1,500,000 | 1,500,000 | 1 | 450,000 | Sept. 1907 | .03 |
| Standard Con., g. s. | Cal | 2,000,000 | 178,600 | 10 | 5,192,641 | Dec. 1907 | .10 |
| Stratton'sIndepend | Colo | 5,500,000 | 1,000,007 | 5 | 4 895.865 | Apr. 1906 | .12½ |
| Swansea, g. s. l. | Utah | 500,000 | 100,000 | 5 | 329,500 | Mar. 1907 | .05 |
| Tamarack, c. | Mich | 1,500,000 | 60,000 | 25 | 9,420,000 | July 1907 | 4.00 |
| Tennessee, c. | Tenn | 5,000,000 | 175,000 | 25 | 1,443,750 | Aug. 1907 | 2.00 |
| Tomboy, g. s. | Colo | 1,750,000 | 300,000 | 5 | 900 000 | June 1906 | .48 |
| Tonopah of Nev. | Nevada | 1,000,000 | 1,000,000 | 1 | 3,500,000 | Oct. 1907 | .25 |
| Tonopah Belmont. | Nevada | 2,000,000 | 1,295,007 | 1 | 518,003 | Apr. 1907 | .10 |
| Tonopah Ext'nsion | Nevada | 1,000,000 | 928,433 | 1 | 278,530 | Apr. 1906 | .15 |
| Tonopah Midway. | Nevada | 1,000,000 | 1,000,000 | 1 | 300,000 | Jan. 1907 | .05 |
| Uncle Sam, g.s.l. | Utah | 500,000 | 500,000 | 1 | 165 000 | Oct. 1907 | .03 |
| United States, com. | Utah | 37,500,000 | 467,430 | 50 | 913,938 | Nov. 1907 | .87½ |
| United States, pfd.* | Utah | 37,500,000 | 348,167 | 50 | 3,937,500 | Nov. 1907 | .87½ |
| United Cop. com. | Mont | 75,000,000 | 450,000 | 100 | 5,962,500 | Aug. 1907 | 1.75 |
| United, c. pf. | Mont | 5 000,000 | 50,000 | 100 | 1,500.000 | May 1907 | 3.00 |
| United, z. l., pf. | Mo.-Kan. | 500,000 | 19.556 | 25 | 303,006 | Oct. 1907 | .50 |
| United, (Crip'le C'k) | Colo | 5,000,000 | 4,009,100 | 1 | 280,071 | Apr. 1906 | .00½ |
| United Verde, c. | Ariz | 3,000,000 | 300,000 | 10 | 19,710 322 | Jan. 1908 | .75 |
| U.S. Red. & Ref. Pf | Colo | 4,000 000 | 39,458 | 100 | 1,005,504 | Oct. 1907 | 1.50 |
| Utah, g.(Fish Sp'gs) | Utah | 1,000,000 | 100,000 | 10 | 282,000 | Oct. 1907 | .03 |
| Utah Con., c. | Utah | 1,500,000 | 300,000 | 5 | 7,686,000 | Jan. 1908 | .50 |
| Victoria, Utah | Utah | 250,000 | 250,000 | 1 | 177,500 | Mar. 1907 | .04 |
| Vindicator Con., g. | Colo | 1,500,000 | 1,500,000 | 1 | 1,710,000 | Oct. 1907 | .03 |
| Wolverine, c. | Mich | 1,500,000 | 60,000 | 25 | 4,500,000 | Oct. 1907 | 7.50 |
| Work, g. | Colo | 1,500,000 | 1,500,000 | 1 | 150,000 | Oct. 1907 | .01 |
| YankeeCon | Utah | 500,000 | 500,000 | 1 | 157,500 | Oct. 1907 | .03 |
| Yellow Aster, g. | Cal | 1,000,000 | 100,000 | 10 | 958,789 | Aug. 1907 | .20 |

*Previous to consolidation $1,436,250 were divided. †Amalgamated.

## Coal, Iron and Other Industrials—United States.

| Name of Company and Location. | | Author. ized Capital. | Shares. Issued. | Par Val. $ | Dividends. Total to Date. | Latest. Date. | Amt. |
|---|---|---|---|---|---|---|---|
| Ala. Con., C. & I., pf. | Ala | $2,500,000 | 24,638 | 100 | $905,265 | May 1905 | $1.75 |
| Allis-Chalmers, pf. | U S | 25,000,000 | 200,000 | 100 | 3,213,750 | Feb. 1904 | 1.75 |
| Amer. Ag. Chem., pf. | U. S | 20,000,000 | 181,530 | 100 | 7,920,460 | Oct. 1907 | 3.00 |
| American Cement. | Pa. | 2,000,000 | 200,000 | 10 | 1,168,000 | Jan. 1908 | .30 |
| American Coal. | Md | 1,500,000 | 50,000 | 25 | 2,367,500 | Sept. 1907 | 1.25 |
| Associated Oil | Cal | 21,000,000 | 21,000,000 | 1 | 630,000 | Aug. 1905 | .01½ |
| Bethlehem Steel, pf. | Pa. | 15,000,000 | 150,000 | 100 | 900,000 | Nov. 1906 | .75 |
| Cambria Steel | Pa. | 50,000,000 | 900,000 | 50 | 8,887,500 | Aug. 1907 | .75 |
| Caribou Oil | Cal | 100,000 | 80,000 | 1 | 56,000 | July 1905 | .07 |
| Central C. & C., com. | Mo | 5,125,000 | 51,250 | 100 | 2,152,500 | Jan. 1908 | 1.50 |
| Central C. & C., pf. | Mo | 1,875,000 | 18,750 | 100 | 1,335,940 | Jan. 1908 | 1.25 |
| Central Oil | W. Va. | 1,500,000 | 60,000 | 25 | 182,500 | May 1904 | .25 |
| Claremont Oil | Cal | 500,000 | 450,000 | 1 | 58,500 | June 1905 | .01 |
| Col. & Hock. C. & I,pf. | Ohio | 7,000,000 | 69,244 | 100 | 279,952 | Oct. 1907 | 1 50 |
| Consolidated Coal | Ill. | 5,000,000 | 50,000 | 100 | 350,000 | July 1904 | 1.00 |
| Consolidation Coal | Md. | 10,250,000 | 102,500 | 100 | 9,262,900 | Oct. 1907 | 1.50 |
| Crucible Steel, pf. | Pa. | 25,000,000 | 250,000 | 100 | 2,125,000 | June 1907 | 1.50 |
| Empire S. & I., pf. | N. J | 5,000,000 | 25,000 | 100 | 787,500 | Jan. 1908 | 3.00 |
| Fairmont Coal, | W. Va. | 12,000,000 | 120,000 | 100 | 1,384,000 | Feb. 1907 | 3.00 |
| Four Oil | Cal | 500,000 | 300,000 | 1 | 105 406 | July 1905 | .01 |
| General Chem. Com. | U. S. | 12,500,000 | 74,103 | 100 | 1,893,331 | Sept. 1907 | 2.00 |
| General Chem., pf. | U. S. | 12,500,000 | 100,000 | 100 | 4,990,178 | Jan. 1908 | 1.50 |
| George's C'k Coal | Md | 2,500,000 | 22,000 | 100 | 1,188,000 | July 1904 | 3.00 |
| Imperial Oil | Cal | 1,000,000 | 100,000 | 100 | 880,000 | July 1905 | .20 |
| International Salt. | | 30,000,000 | 182,280 | 100 | 927,060 | Dec. 1906 | 1.00 |
| Jeff. & Cl'f C. & I, cm | Pa. | 1,500,000 | 15,000 | 100 | 330,000 | Aug. 1905 | 5.00 |
| Jeff. & Cl'f. C. & I.,pf. | Pa. | 1,500,000 | 15,000 | 100 | 825,500 | Aug. 1906 | 2.50 |
| Kern River Oil | Cal | 2,000,000 | 20,000 | 100 | 39,500 | May 1905 | .13 |
| Lehigh Coal & Nav. | Pa. | 17,378,500 | 346,901 | 50 | 26,308,495 | Nov. 1907 | 2.00 |
| Maryland Coal,pf. | Md | 2,000,000 | 18,850 | 100 | 1,667,960 | Jan. 1908 | 4.00 |
| Monon R. Coal, pf. | Pa. | 10,000,000 | 100,000 | 100 | 3,854.945 | Jan. 1908 | 3.50 |
| National Carbon, pf. | U. S. | 4,500,000 | 45,000 | 100 | 2,047,500 | May 1905 | 1.75 |
| National Lead, com. | N. Y. | 15,000,000 | 149,054 | 100 | 2,347,602 | Jan. 1908 | 1.25 |
| National Lead, pf. | N. Y. | 15,000,000 | 149,040 | 100 | 16,845,968 | Dec. 1907 | 1.75 |
| Nat'l Steel & Wire,pf. | N. Y. | 5,000,000 | 25,778 | 100 | 631,561 | May 1906 | 1.75 |
| New Central Coal | Md. | 1,000,000 | 50,000 | 20 | 350,000 | May 1907 | .40 |
| New River Coal, pfd. | W. Va. | 4,000,000 | 37,617 | 100 | 225,702 | Nov. 1907 | 1.50 |
| Pacific Coast Borax. | Cal. | 2,000,000 | 19,000 | 100 | 2,086,500 | Aug. 1905 | 1.00 |
| Peerless Oil | al | 1,000,000 | 92,000 | 10 | 396,320 | May 1905 | .14 |
| Penna. Salt. | Pa. | 3,000,000 | 60,000 | 50 | 14,738,000 | Oct. 1907 | 3.50 |
| Penna. Steel, pfd. | Pa. | 25,000,000 | 168,214 | 100 | 8,204,493 | Nov. 1907 | 3.50 |
| Phila. Gas, com | Pa. | 28,953,029 | 579,061 | 50 | 8,484,336 | Nov. 1907 | .75 |
| Phila. Gas, pf. | Pa. | 6,000,000 | 120,000 | 50 | 2,550,000 | Sept. 1907 | 1.25 |
| Pittsburg Coal, pf. | Pa. | 32,000,000 | 297,010 | 100 | 11,434,962 | Apr. 1906 | 1.75 |
| Pocahontas Coll., pf.† | W. Va. | 2,800,000 | 28,000 | 100 | 84 000 | Jan. 1908 | 3.00 |
| Pocahontas Coll.,cm† | | 4,520,000 | 45,200 | 100 | 135,600 | Oct. 1907 | 3.00 |
| Republic I. & S., pfd. | Ill. | 25,000,000 | 204,169 | 100 | 5,688,042 | Dec. 1907 | 1.75 |
| Sloss-Sheffield, com. | Ala | 10,000,000 | 100,000 | 100 | 1,500,000 | Dec. 1907 | 1.25 |
| Sloss-Sheffield, pf. | Ala | 10,000,000 | 67,000 | 100 | 3,400,250 | Jan. 1908 | 1.75 |
| Standard Oil | U. S. | 100,000,000 | 970,000 | 100 | 590,722,905 | Nov. 1907 | 10 00 |
| Tenn. C. & I., com. | Tenn | 22,553,600 | 225,536 | 100 | 3,583,060 | Nov. 1907 | 1.00 |
| Tenn. C. & I., pf. | Tenn | 248,000 | 2,480 | 100 | 390,040 | Nov. 1907 | 2.00 |
| Texas & Pacific Coal. | Texas | 2,000,000 | 20,000 | 100 | 1,990.000 | Dec. 1907 | 1.50 |
| United Metals Selling | | 5,000,000 | 50,000 | 100 | 4,875,000 | Jan. 1908 | 7.50 |
| U. S. SteelCorp.,cm., | | 550,000,000 | 5,083,025 | 100 | 68.583.053 | Dec. 1907 | .50 |
| U. S. Steel Corp., pf. | U. S. | 360,281,100 | 3,603,141 | 100 | 193,760,221 | Nov. 1907 | 1.75 |
| Va. Carolina Ch., pf. | U. S. | 20,000,000 | 180,000 | 100 | 12,900,869 | Jan. 1908 | 2.00 |
| Warwick I. & S. | U. S. | 1,500,000 | 145,581 | 1 | 473,138 | Nov. 1907 | .30 |
| Westmoreland Coal | Pa. | 3,000,000 | 60,000 | 50 | 8,580,000 | Oct. 1905 | 2.50 |

## Canada, Mexico, Central and South America.

| Name of Company and Location. | | Author-ized Capital. | Shares. Issued. | Par Val. $ | Dividends. Total to Date. | Latest. Date. | Amt. |
|---|---|---|---|---|---|---|---|
| Amistad y Conc'rdia. | Mex | $480,000 | 9,600 | 50 | $258,064 | Jan. 1905 | $1.71 |
| Batopilas | Mex | 9,000,000 | 446,268 | 20 | † 55,784 | Dec. 1907 | .12½ |
| Buffalo, s. | Ont. | 1,000,000 | 900,000 | 100 | 162,000 | Jan. 1908 | .08 |
| Butters' Salvador, g. | Salv | 750,000 | 150,000 | 5 | 600,000 | Apr. 1905 | .25 |
| Coniagas (Cobalt) | Ont. | 1,000,000 | 1,000,000 | 1 | 20 000 | July 1907 | .02 |
| Consolidated M & S. | B. C. | 5,500,000 | 53,552 | 100 | 781,885 | Nov. 1907 | 1.25 |
| Copiapo, c. | Chile | 1,125,000 | 112,500 | 10 | 3,000,900 | Oct. 1904 | 1.20½ |
| Crow's Nest Pass | B. C. | 3,500,000 | 140,000 | 25 | 2,018,648 | July 1907 | .62½ |
| Dominion Coal, com. | N. S. | 15,000,000 | 150,000 | 100 | 2,550,000 | Jan. 1908 | 1.00 |
| Dominion Coal, pf. | N. S. | 3,000,000 | 30,000 | 100 | ‡525,000 | Aug. 1907 | 3.00 |
| Dos Estrellas, g. s. | Mex | 150,000 | 3,000 | 50 | 1,020,585 | July 1905 | 13.65 |
| El Oro, g. s. | Mex | 5,750,000 | 1,080,000 | 5 | 3 823,200 | July 1907 | .37 |
| Esperanza, s. g. | Mex | 2,275,000 | 455,000 | 5 | 6,721,649 | July 1907 | 1.32 |
| Foster Cobalt, s. | Ont. | 1,000,000 | 1,000,000 | 1 | 50,000 | Jan. 1907 | .05 |
| Granby Con | B. C. | 15,000,000 | 135,000 | 100 | 2,968,630 | Sept. 1907 | 3.00 |
| Greene Con. Copper. | Mex | 8,640,000 | 864,000 | 10 | 6,137,800 | Mar. 1907 | .40 |
| Greene Con. Gold. | Mex | 5,000,000 | 500,000 | 10 | 300,000 | July 1905 | .20 |
| GreenGold-Silv'r,pfd | Mex | 3,000,000 | 300,000 | 10 | 120,000 | Mar. 1907 | .40 |
| Guanajuato | Mex | 3,000,000 | 540,000 | 5 | 74,250 | Oct. 1906 | .07½ |
| Guggenheim Expl. | Mex | 17,000,000 | 105,000 | 100 | 3,960,000 | Jan. 1908 | 2.50 |
| Kerr Lake, s. | Ont. | 3,000,000 | 600,000 | 5 | 480,000 | Jan. 1908 | .15 |
| LeRoi No. 2, g. | B. C. | 3,000,000 | 120,000 | 25 | 716,400 | Feb. 1907 | .24 |
| McKinley-Darragh,s | Ont. | 2,500,000 | 2,000,000 | 1 | 150,000 | Jan. 1908 | .04 |
| Mexican Coal & Coke | Mex | 5,000,000 | 50,000 | 100 | 600,000 | Dec. 1905 | 3.00 |
| Mex. Con. M. & S. Co. | Mex | 2,500,000 | 240,000 | 10 | 600,000 | Aug. 1907 | .50 |
| Mines Co. of Am. | Mex | 2,000,000 | 2,000,000 | 1 | 2,905,000 | Dec. 1907 | .02 |
| N. Y. & Hond. Ros. | C. A. | 1,500,000 | 150,000 | 10 | 2,367,000 | Dec. 1907 | .10 |
| Nipissing, s. | Ont. | 6,000,000 | 1,200,000 | 5 | 1,500,000 | Jan. 1908 | .15 |
| North Star | B. C. | 1,500,000 | 1,300,000 | 1 | 351,000 | Dec. 1904 | 1.00 |
| N. S. St. & Coal, com. | N. S. | 5,000,000 | 49,876 | 100 | 1,013,042 | Oct. 1907 | 1.50 |
| N. S. St. & Coal, pf. | N. S. | 1,030,000 | 10,300 | 100 | 417,150 | Oct. 1907 | 2.00 |
| Penoles* | Mex | 250,000 | 2,500 | 100 | 8,263,375 | Aug. 1907 | 20.00 |
| Platanillo | Mex | 500,000 | 206,989 | 1 | 5,580 | Sept. 1906 | .00½ |
| Reco, g. s.l | B. C. | 1,000,000 | 958,000 | 1 | 327.082 | Apr. 1906 | .02 |
| Silver Queen, s. | Ont. | 1,500,000 | 1,500,000 | 1 | 120,000 | Jan. 1907 | .08 |
| Slocan Star | B. C. | 500,000 | 500,000 | 1 | 575,000 | Dec. 1904 | .05 |
| St. Eugene Con. | B. C. | 3,500,000 | 3,202,000 | 1 | 402,120 | Oct. 1905 | .02 |
| Tezuitlan Copper | Mex | 1,000,000 | 10,000 | 100 | | Oct. 1907 | 2.00 |
| Tilt Cove, c. | N. F. | 1,000,000 | 89,000 | 2 | 21,360 | Jan. 1905 | .48 |
| Tretheway, s | Ont. | 1,000,000 | 1,000,000 | 1 | 80,000 | Mar. .907 | .04 |
| Tyee, c | B. C. | 940.000 | 180,000 | 5 | 136.800 | Dec. 1904 | .24 |

*Mexican Currency. †Since reorganization. ‡Since August, 1905.